I385.314
DRAF 4
c.3

St. Louis Metro Area Rail Gateway Enterprise

08250998

DRAFT ENVIRONMENTAL IMPACT STATEMENT
Technical Supplement
NOISE ANALYSIS

ILLINOIS DOCUMENTS
AUG 6 1981
ILLINOIS STATE LIBRARY

U.S. Department of Transportation

Illinois Department of Transportation

Appendix I

Appendix II

TECHNICAL SUPPLEMENT

NOISE ANALYSIS

St. Louis Metro Area Rail Gateway Enterprise

Prepared for:

Federal Railroad Administration
Illinois Department of Transportation
St. Louis MARGE
325 Missouri Avenue

Prepared by:

Sverdrup-Envirodyne-Knight
St. Louis, Missouri

June, 1981

ILLINOIS STATE LIBRARY

1129 00260 5574

I385.314
DRAFT
c.3

EXECUTIVE SUMMARY

This Report will provide a detailed technical explanation of the noise impacts summarized in the Environmental Impact Statement (EIS) for the St. Louis Metro Area Rail Gateway Enterprise. Included are: field measurements of existing noise levels; predicted future noise levels; impact analyses; mitigation measures; and the noise model used for the calculations. The approach and methodologies used during the noise impact assessment are documented here. Sources are referred to by number throughout the text and are listed in the bibliography. This report is one of a series prepared as background information to be used in the decision making process and for input to the EIS.

The day-night average sound level, symbolized as L_{dn}, is recommended as the common noise descriptor and will be used in the report (2,10). L_{dn} ,measured in standard noise units called decibels (dBA), accounts for both the duration and magnitude of fluctuating sound levels, placing a greater emphasis on the occasional high noise levels which can be quite disturbing. The L_{dn} is a 24-hour average sound level in which noise levels occurring between 10 p.m. and 7 a.m. are increased by 10 dBA before the average is calculated in order to account for the increased sensitivity of people to noise intrusion at night.

Since the railroad facilities within the MARGE project area operate at night, L_{dn} is the noise descriptor which will best determine the noise impacts. Standards recently proposed by the U.S. Environmental Protection Agency (USEPA) state that noise levels shall not exceed an L_{dn} of 65 dBA from any railroad hump yard facility.

In summary, the major noise impacts of the proposed MARGE project would result from the construction of new and expanded rail yards adjacent to residential areas. The towns receiving the greatest impacts would be Centreville and Brooklyn, with noise levels increasing by 14 to 17 dBA .

Expanded yards would be located closer to the housing of Centreville and Brooklyn in the Two-Yard Alternative. Venice and National City would also be impacted under the Two-Yard Alternative. The noise impacts from both Three-Yard Alternatives would be less severe, particularly in the towns where housing would be relocated. In Centreville the Three-Yard Bidirectional Plan would cause the fewest noise impacts. The proposed Trailer-on-Flatcar (TOFC) Yard site along the Willows Corridor is not expected to produce any noise impacts. In terms of total number of residences affected, noise from rail corridor operations has the greatest impact, however, project construction would cause little change in noise levels emitted from these operations.

A combination berm and wall is recommended to reduce property line noise levels and to meet current and anticipated noise standards. Although there will be increases in noise levels, the construction of noise barriers as a part of any of the build alternatives would actually reduce the number of residences exposed to railroad noise over the No-Build case. In the Two-Yard Plan there would be 18% fewer homes affected; in the Three-Yard Directional Plan 11% fewer; and in the Three-Yard Bidirectional Alternative 9% fewer.

TABLE OF CONTENTS

	Page
Executive Summary	i
Table of Contents	ii
Project Description	1
Existing Noise Conditions	7
Project Effects	22
Vibration	33
Alternative Abatement Measures	34
Conclusions	41
References	44
Appendix I	45
A Corridor Input Data	
B Instrumentation and Techniques	
C Noise Model Verification	
D Railroad Noise Model	
Appendix II - Noise Receptor Location Maps	

EXHIBITS

A Study Area Map	2
B Noise Analysis Areas	8

TABLES

1 Predicted Corridor Noise Levels	10-13
2 Predicted Yard Noise Levels	14,15
3 Existing Noise Levels	19
4 Residences Exposed to Noise	25
5 Route 3 Noise Levels	30

PROJECT DESCRIPTION

Background

The St. Louis railroad complex, alternately called a "gateway" or a "terminal", is of major importance to the national railroad network, and its vitality is critical to the industrial and economic health of the region. Geographically, it lies near the nation's center. Situated on the banks of the Mississippi, the Gateway takes in portions of the States of Missouri and Illinois. On the west side, the majority of the rail facilities lie near the river. On the east side, however, the network extends eastward some five miles to include the Alton & Southern (A &S) Corridor east of Washington Park. The major Illinois communities within the project area are East St. Louis, Granite City, Madison, Venice, Brooklyn, Cahokia, Centreville, Alorton, Dupo, Washington Park and Fairmont City. The southern boundary is the Bixby Rail Junction south of Dupo, and the northern boundary is Lenox Rail Tower in Mitchell. Exhibit A shows the St. Louis Gateway area.

The St. Louis Gateway is the second largest rail traffic routing center in the nation. The network includes track or facilities belonging to 14 major (Class I) railroad companies, and 3 Class II (switching) carriers. There are approximately 82 miles of mainline corridors in the gateway area. The sorting of cars into groups, or cuts, for delivery to individual railroads is mainly accomplished in two large common classification yards, Madison Yard on the north and Gateway Yard on the south. Specific classifications destined for distant points in the country are performed in a series of "home" yards where individual railroads also handle trailer traffic. Gateway Yard is operated by the Alton and Southern Railroad, while the Terminal Railroad Association (TRRA), a corporation composed of eleven railroads operating in the complex, manages the functions of Madison Yard. Individual roads are charged by either of these switching carriers for the rail cars which go through the classification process in their facilities.

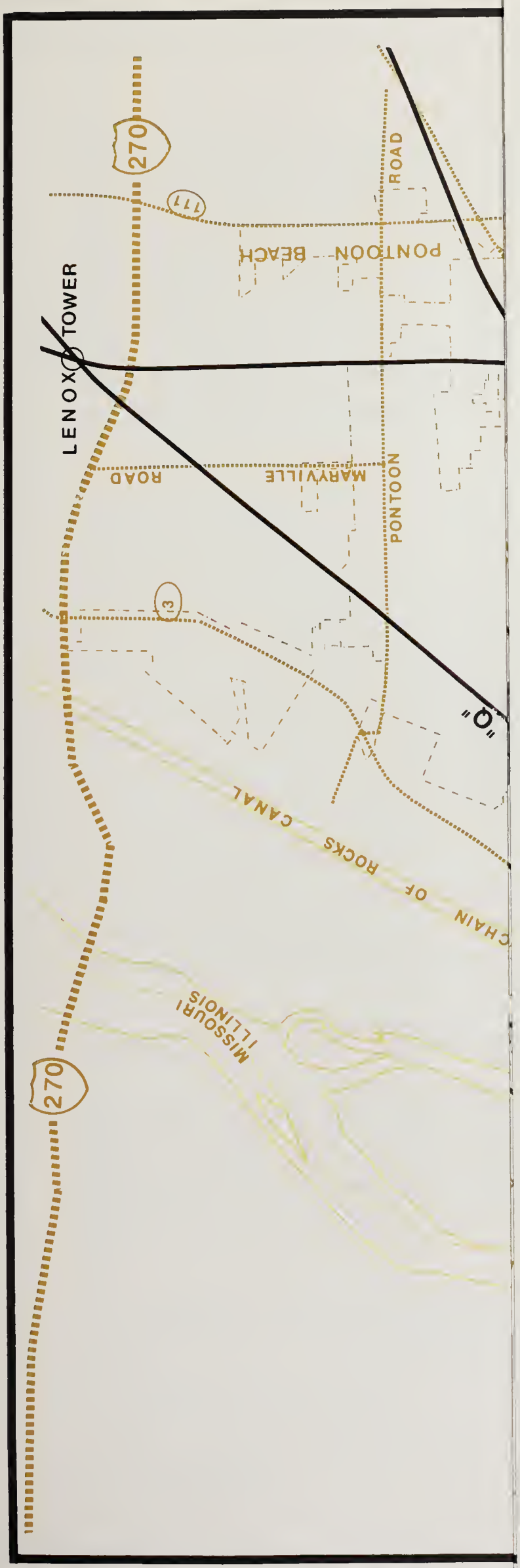


EXHIBIT A

STUDY AREA

VICINITY MAP

LEGEND

- ROUTE 3 RELOCATION AREA
- RAILROADS
- INTERSTATES
- PROPOSED RAILROAD YARD
- CITY STREETS
- EXISTING RAILROAD YARD

6000 3000 0 5700

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

EXHIBIT A

STUDY AREA

VICINITY MAP

LEGEND

- ROUTE 3 RELOCATION AREA
- RAILROADS
- INTERSTATES
- PROPOSED RAILROAD YARD
- CITY STREETS
- EXISTING RAILROAD YARD

6000 3000 0 5700

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Railroad freight terminals, such as the one in St. Louis, are typically bottlenecks in the operation of rail systems. Increased rail traffic and age have reduced the efficiency of terminal operations and shipments often encounter excessive delays moving through congested switching and classification facilities. Facilities built early in the development of the rail system have become obsolete, but have continued to occupy sizeable amounts of land, constraining land use patterns and forming barriers to social and commercial activity.

In the St. Louis Gateway the situation is worsened by the continued presence of yards and tracks originally built near the river to hold cars awaiting the ferry crossing. These facilities became unnecessary as bridges were built and were used less and less until, in some cases, they were virtually abandoned. As in other urban rail terminals, this has served as a blighting influence on the area's economic development. Further, underutilized railroad properties do not yield tax revenues proportional to the amount of land they cover. The complicated network of yards and track has also produced a contorted street system where delays to vehicular traffic are frequent and lengthy. This combination of problems attributable to railroad influences has lead the Federal Railroad Administration (FRA), in concert with state and local officials, to seek ways to improve rail operations and to create valuable urban development opportunities by freeing riverfront land.

St. Louis Metro Area Rail Gateway Enterprise

The efforts of the FRA toward resolving the problems of the St. Louis Gateway through railroad improvements were focused into a three phase program entitled the Metro Area Rail Gateway Enterprise or MARGE. The program focused on accomplishing the following three objectives:

- To improve the efficiency of railroad operations within the St. Louis Railroad Terminal
- To reduce rail/community conflicts, particularly train/auto conflicts
- To provide opportunities for economic and community development

Phase I, which was successfully completed in December, 1977, was limited to the development and preliminary examination of operationally feasible physical restructuring alternatives. This initial study was jointly directed by the Federal Railroad Administration and all the 17 railroads operating in the Terminal.

Phase II, which was begun in January, 1979, is a more comprehensive study to refine the restructuring plans and resolve the various railroad institutional issues as well as the community and environmental impact issues. Phase II includes a cost/benefit analysis for each of the railroads involved, together with a comprehensive cost/benefit analysis of the railroad restructuring, and will culminate in the publication of an Environmental Impact Statement. Managed by the Illinois Department of Transportation (IDOT), under contract to the FRA, Phase II has sought active involvement by the various local communities in the Gateway area, and continued the strong railroad role of Phase I.

Phase III involves final design engineering and actual construction of improvements to the rail yards and corridors in the terminal. It begins after an alternative plan for the restructuring is selected.

Restructuring Alternatives

There are currently some 63 railyards in the St. Louis Gateway. The MARGE project proposes consolidation of many of the smaller rail yards into two or three larger yard facilities. Three "build" alternatives are fully evaluated. Each alternative differs by the number of common carrier yards and by the routing of the corridor traffic. In addition, the existing 1979 conditions and the year 2000 "No Build" alternative are analyzed and compared.

The actual yard restructuring alternatives exhibit differences in both the number of yards which would be constructed and the manner in which those yards would operate:

- Two-Yard Alternative - This plan calls for the expansion of the two existing classification yards. The Gateway Yard, located south of East St. Louis, would be expanded eastward. This area is partly within the boundaries of Centreville, Illinois and is currently agricultural and residential. The Madison Yard, which is just east of Venice, would be modified and expanded south past the residential areas of Brooklyn and National City.

- Three-Yard Directional Alternative - This plan involves the expansion of Gateway Yard, minor improvements to Madison Yard and the construction of a third yard, the "New Yard". This third yard would be located just south of Madison Yard, adjacent to the town of Brooklyn. Madison Yard would then function as an industrial support yard with the classification functions transferred to New Yard. The Directional distinction refers to the operational plan for the yards, which would have one yard handle trains coming from the East and headed West, and the other coming from the West and headed East.

- Three-Yard Bidirectional - This plan is distinguished from the above only in the operational plan of car and train routing. Each yard would route traffic in all directions. The physical configurations of the yards would be similar to the Directional Plan, except that the New Yard would be located approximately 200 feet further from the residential areas of Brooklyn, and that the expanded Gateway Yard would be constructed about 200 feet farther south from the housing areas of Centreville.

- No-Build Alternative - As a benchmark against which to analyze the "build" alternatives, a "no-build" situation has also been studied. This plan assumes that no improvements are made to the Gateway terminal. The No-Build Alternative assumes that the same traffic levels will exist in St Louis in the Year 2000 as are projected for the Build cases. This traffic, to the extent it overtaxes the common classification yards, would be handled at individual rail yards.

Several elements of the consolidation are the same across all the "build" alternatives.

- A segment of Illinois Route 3 would be relocated in order to bypass the expanded yards. The designated section begins just north of Merchants Bridge in Madison County as four-lane highway and continues 3 miles south as a two-lane road through Venice and Brooklyn, past National City, ending at St. Clair Avenue in East St. Louis. The relocation would provide a two- or four-lane, limited-access highway for this distance.

- A common trailer-on-flatcar (TOFC) yard would be constructed east of Brooklyn and north of East St. Louis. The location is convenient to a major interchange connecting Illinois Route 203 and Interstate 70, providing excellent access for trucks. A major rail corridor runs just west of the site. Eight or nine of the thirteen Class I carriers would consolidate their TOFC, or piggyback operations into that one yard.

- There are approximately 82 miles of main line rail corridor in the project area, and much of this would be upgraded under all of the build alternatives. Track would be physically improved by laying new or replacement track and modern centralized signaling systems would be installed. Several new rail connections or interlockings would be constructed, but the locations of the corridors and existing interlockings would remain the same. Rail operations and train routings may vary across alternatives, but the basic corridor network does not.

- Seventeen-eighteen grade-separation structures are warranted under all the build alternatives, due to the large delay- and collision-related conflicts which occur in the project area. Seven of these would be warranted because of yard expansions; the remainder are warranted due to conflicts along the rail corridors. Nine of these structures would also be warranted under the No-Build Alternative.

EXISTING NOISE CONDITIONS

The Metro East Area of Illinois is the primary focus of the MARGE project activities. Several of the communities included in the project area are currently subject to noise impacts from widespread railroad operations. The first step in assessing the degree to which the terminal restructuring would change those noise levels is the description of existing conditions. Noise standards which have been proposed by the U.S. Environmental Protection Agency (EPA) will be used as the parameters of this noise analysis.

Adjacent Land Uses

The land uses adjacent to railroad facilities in the project area are a mixture of residential, commercial, industrial, and agricultural/ vacant uses. The residential areas are concentrated in the cities of Granite City, Madison, Venice, Brooklyn, East St. Louis, Centreville, Cahokia and St. Louis.

Since residential areas are the most sensitive to noise impacts, project monitoring was conducted at locations devoted predominantly to housing. Thirteen areas were selected for the analysis, each incorporating fairly homogeneous land use characteristics. Receptors, or structures receiving sound, within each area would be subjected to similar noise impacts from the adjacent railroad facilities under each alternative of the proposed project. These major areas are identified along with the residential land use areas in Exhibit B and are listed below according to nearby railroad operations.

- Area 1 - Granite City and Mitchell on both sides of the A&S and Q Corridors
- Area 2 - North Venice bounded by the Willows, Merchants Bridge, and Q Corridors
- Area 3 - Madison east of the Willows Corridor

EXHIBIT B

AREAS OF NOISE IMPACTS

VICINITY MAP

LEGEND

RESIDENTIAL REFERENCE NUMBER	1
PROPOSED RAILROAD YARD	
EXISTING RAILROAD YARD	
RESIDENTIAL	

6000 3000 0 5700

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

EXHIBIT B

AREAS OF NOISE IMPACTS

VICINITY MAP

LEGEND

RESIDENTIAL REFERENCE NUMBER 1

PROPOSED RAILROAD YARD

EXISTING RAILROAD YARD

RESIDENTIAL

6000 3000 0 5700

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

- Area 4 - Venice bounded by the Madison Yard and Merchants Bridge and Q Corridors
- Area 5 - Venice Township east of Madison Yard and north of the Illinois Terminal tracks
- Area 6 - Brooklyn west of proposed New Yard and expanded Madison Yard
- Area 7 - National City east of the proposed expanded Madison Yard
- Area 8 - East St. Louis intersected by the Willows, Rose Lake, MacArthur Bridge, A&S, and Q Corridors; and the area next to the proposed TOFC facility
- Area 9 - Alorton, Fairmont City, and Washington Park intersected by the Rose Lake and A&S Corridors
- Area 10 East St. Louis west of Gateway Yard and the MacArthur Bridge approach to Valley Junction
- Area 11 East St. Louis along the north property line of the existing Gateway Yard and MacArthur Bridge approach
- Area 12 Centreville around the proposed extension of Gateway Yard
- Area 13 Cahokia, East Carondelet, and Dupo intersected by the Willows Corridor and Dupo By-Pass

Individual residences were selected for analysis of noise levels under each alternative of the proposed project. These receptors were the "worst case" residences that would most likely receive the greatest noise impacts from railroad sources under the proposed project. In addition, all schools and churches that would be subjected to railroad noise were analyzed. The 194 receptors are identified with standard mapping symbols and reference numbers on the aerial photographs included as Appendix II of the Noise Analysis Report. Tables 1 and 2 provide a listing of the receptor locations; the numbers given in this chapter enclosed in parentheses are receptor numbers.

Noise Standards

On April 17, 1979, the USEPA published in the Federal Register (44 FR 22960) the property line standard for overall railyard facility and

TABLE 1

PREDICTED RECEPTOR NOISE LEVELS DUE TO RAILROAD CORRIDOR OPERATIONS
[Levels in dBA L_{dn} (24 hours)]

Receptor Number	Residential Area	Railroad Corridor	Distance (Ft)	Existing 1979	No Build 2000	Two-Yard 2000	Three-Yard Directional	Three-Yard Bidirectional
1	East St. Louis	Willows	280	63	61	59	59	56
2	East St. Louis	Willows	320	63	60	60	60	56
3	East St. Louis	Q	160	66	67	69	69	67
4	East St. Louis	Q	630	58	60	60	60	59
5	East St. Louis	Q	220	65	67	68	67	66
6	East St. Louis	MacArthur Bridge	90	75	76	75	75	76
7	East St. Louis	Q	340	63	65	65	65	64
8	East St. Louis	MacArthur Bridge	90	75	77	76	76	76
9	East St. Louis	Q	170	65	66	69	69	66
10	Brooklyn	Q	350	62	60	62	61	59
11	Venice	McKinley Bridge	80	58	57	58	59	59
12	Venice	McKinley Bridge	150	66	66	67	67	68
13	Venice	Q	80	73	73	74	74	75
14	North Venice	Q	400	59	59	60	61	61
15	North Venice	Q	650	55	54	56	56	56
16	North Venice	Q	90	72	72	73	73	74
17	North Venice	Q	340	61	60	61	62	62
18	North Venice	Q	510	57	56	58	58	59
19	Granite City	Q	850	57	56	55	55	55
20	Granite City	Q	830	55	54	54	54	55
21	Granite City	Q	340	63	62	62	62	63
22	Granite City	Q	700	57	55	56	56	56
23	Granite City	Q	470	60	59	59	59	60
24	Granite City	Q	430	61	60	60	60	61
25	Granite City	Q	160	69	68	68	68	69
26	Granite City	Q	750	56	55	55	55	56
27	Granite City	Q	840	55	54	54	54	55
28	Granite City	Q	470	60	59	59	59	60
29	Granite City	Q	700	57	55	56	56	56
30	Granite City	Q	250	66	64	64	64	65
31	Granite City	Q	160	69	68	68	68	69
32	Granite City	Q	160	69	68	68	68	69
33	Granite City	Q	160	69	68	68	68	69
34	Granite City	Q	220	67	65	66	66	66
35	Granite City	Q	280	65	63	64	64	64
36	Granite City	Q	290	64	63	63	63	64
37	Granite City	Q	230	66	65	65	65	66
38	Granite City	Q	480	60	59	59	59	60
39	Mitchell	A&S	230	64	63	62	62	63
40	Mitchell	Q	400	62	61	61	61	61
41	Mitchell	A&S	200	65	64	63	63	64
42	Mitchell	Q	280	65	63	64	64	64
43	Alorton	A&S	810	60	59	55	55	55
44	Alorton	A&S	780	60	59	56	56	55
45	Alorton	A&S	820	60	59	55	55	55
46	Alorton	A&S	810	60	59	55	55	55
47	Alorton	A&S	110	77	76	73	73	72

TABLE 1

PREDICTED RECEPTOR NOISE LEVELS DUE TO RAILROAD CORRIDOR OPERATIONS
[Levels in dBA L_{dn} (24 hours)]

(Continued)

Receptor Number	Residential Area	Railroad Corridor	Distance (Ft)	Existing 1979	No Build	Two-Yard 2000	Three-Yard Directional	Three-Yard Bidirectional
48	Alorton	A&S	70	81	80	77	76	76
49	Alorton	A&S	100	82	79	73	73	72
50	East St. Louis	A&S	210	76	73	67	67	66
51	East St. Louis	A&S	90	83	80	74	74	73
52	East St. Louis	A&S	270	74	71	64	64	64
53	East St. Louis	A&S	220	75	73	66	76	65
54	East St. Louis	A&S	120	81	78	71	72	71
55	Washington Park	A&S	270	67	68	64	65	65
56	Fairmont City	A&S	380	64	65	61	62	62
57	Fairmont City	A&S	120	74	75	71	72	72
58	Washington Park	A&S	820	54	53	52	53	53
59	Granite City	A&S	75	70	69	66	66	68
60	Granite City	A&S	80	70	68	66	66	67
61	Granite City	A&S	315	58	56	54	54	55
62	Mitchell	A&S	200	63	62	60	60	61
63	Mitchell	Q	330	64	62	62	62	63
64	Granite City	Q	850	57	56	55	55	55
65	Madison	Willows	60	77	77	71	70	73
66	Madison	Willows	90	74	73	67	67	69
67	East St. Louis	Willows	150	70	70	69	70	70
68	East St. Louis	Willows	150	68	68	66	67	66
69	East St. Louis	Willows	150	67	67	63	63	57
70	East St. Louis	Willows	220	64	63	60	60	54
71	East St. Louis	Willows	70	74	73	70	70	64
72	East St. Louis	Willows	390	59	59	55	55	49
73	East St. Louis	Willows	80	73	72	69	69	63
74	East St. Louis	Willows	30	81	81	77	77	71
75	East St. Louis	Willows	670	54	54	50	50	44
76	East St. Louis	Willows	30	82	79	77	77	72
77	East St. Louis	Willows	540	57	54	52	52	47
78	East St. Louis	Willows	550	57	54	51	51	47
79	East St. Louis	MacArthur Bridge	110	66	62	60	60	55
80	East St. Louis	MacArthur Bridge	90	75	76	75	75	76
81	East St. Louis	MacArthur Bridge	100	74	76	74	74	75
82	East St. Louis	MacArthur Bridge	60	78	80	79	78	79
83	Sauget	Willows	400	62	63	63	63	63
84	Cahokia	Willows	50	80	81	81	81	82
85	Cahokia	Willows	70	77	79	78	78	79
86	Cahokia	Willows	100	74	75	75	75	76
87	Cahokia	Willows	440	61	62	62	62	63
88	Cahokia	Willows	160	70	71	71	71	71
89	Cahokia	Willows	280	65	66	66	66	67
90	North Dupo	Willows	60	78	80	79	79	80
91	North Dupo	Willows	220	67	68	68	68	69
92	North Dupo	Willows	130	70	73	72	73	73
93	North Dupo	Willows	500	58	61	60	61	61
94	Dupo	Willows	110	72	74	73	74	75
95	Dupo	Willows	95	73	75	74	76	76

TABLE 1

PREDICTED RECEPTOR NOISE LEVELS DUE TO RAILROAD CORRIDOR OPERATIONS
[Levels in dBA L_{dn} (24 hours)]

(Continued)

Receptor Number	Residential Area	Railroad Corridor	Distance (Ft)	Existing 1979	No Build	Two-Yard 2000	Three-Yard Directional	Three-Yard Bidirectional
96	Dupo	Willows	450	59	62	61	62	62
97	Dupo	Willows	80	74	77	76	77	77
98	Dupo	Willows	65	76	79	78	79	79
99	Cahokia	Dupo By-Pass	410	40	42	56	50	-(1)
100	Dupo	Dupo By-Pass	40	60	62	76	71	-(1)
101	Dupo	Willows	100	74	75	75	75	76
102	Dupo	Willows	260	66	67	67	67	67
103	East St. Louis	Dupo By-Pass	300	61	62	64	64	63
104	East Carondelet	Dupo By-Pass	90	61	62	71	72	70
105	East Carondelet	Dupo By-Pass	50	66	67	76	77	75
106	East Carondelet	Dupo By-Pass	90	61	62	71	72	70
107	Dupo	Dupo By-Pass	160	56	57	66	67	65
108	East St. Louis	Rose Lake	500	49	53	59	58	58
109	East St. Louis	Rose Lake	500	49	53	59	58	58
110	East St. Louis	Rose Lake	80	65	69	75	74	73
111	East St. Louis	Rose Lake	720	46	50	56	55	54
112	East St. Louis	Rose Lake	200	67	67	66	67	67
113	East St. Louis	Willows	150	68	68	65	66	64
114	East St. Louis	Rose Lake	170	65	66	67	68	68
115	East St. Louis	Rose Lake	500	56	56	57	59	59
116	East St. Louis	Rose Lake	480	56	57	58	59	59
117	East St. Louis	Rose Lake	140	67	67	68	70	70
118	East St. Louis	Rose Lake	250	62	62	63	65	65
119	East St. Louis	Rose Lake	200	64	64	65	67	67
120	Washington Park	Rose Lake	150	66	67	68	69	69
121	St. Louis	Hiline	200	68	69	65	61	63
122	St. Louis	Hiline	550	60	60	57	52	54
123	St. Louis	Hiline	100	74	75	71	67	69
124	East St. Louis	MacArthur Bridge	70	77	79	78	77	78
125	East St. Louis	Q	170	67	68	70	69	68
126	East St. Louis	MacArthur Bridge	330	64	66	65	65	65
127	East St. Louis	MacArthur Bridge	90	75	76	75	75	76
128	East St. Louis	MacArthur Bridge	70	77	79	77	77	78
129	East St. Louis	MacArthur Bridge	60	78	80	78	78	79
130	East St. Louis	MacArthur Bridge	140	71	73	71	71	72
131	East St. Louis	MacArthur Bridge	500	60	61	60	60	61
132	East St. Louis	MacArthur Bridge	55	79	81	79	79	80
133	East St. Louis	MacArthur Bridge	220	67	69	67	67	68
134	East St. Louis	MacArthur Bridge	600	58	60	58	58	59
135	East St. Louis	MacArthur Bridge	400	62	63	62	62	63
136	East St. Louis	MacArthur Bridge	120	73	74	73	72	73
137	East St. Louis	MacArthur Bridge	150	70	72	71	70	71
138	East St. Louis	MacArthur Bridge	70	77	79	77	77	78
139	East St. Louis	MacArthur Bridge	210	69	70	68	68	69
140	North Venice	Q	450	62	62	60	60	61
141	North Venice	Merchants Bridge	440	64	64	59	59	59

TABLE 1

PREDICTED RECEPTOR NOISE LEVELS DUE TO RAILROAD CORRIDOR OPERATIONS
[Levels in dBA L_{dn} (24 hours)]

(Continued)

Receptor Number	Residential Area	Railroad Corridor	Distance (Ft)	Existing 1979	No Build 2000	Two-Yard 2000	Three-Yard Directional	Three-Yard Bidirectional
142	Venice	Merchants Bridge	300	67	67	61	60	61
143	North Venice	Merchants Bridge	570	62	62	56	55	56
144	Venice	McKinley Bridge	150	64	63	65	65	65
145	Venice	McKinley Bridge	120	54	53	55	55	55
146	Venice	McKinley Bridge	100	53	53	54	54	55
147	Venice Township	McKinley Bridge	420	(1)	(1)	(1)	(1)	(1)
148	Venice Township	McKinley Bridge	330	(1)	(1)	(1)	(1)	(1)
149	Venice Township	McKinley Bridge	270	(1)	(1)	(1)	(1)	(1)

NOTE: (1) No railroad traffic on corridor segment under this alternative.

TABLE 2

PREDICTED RECEPTOR NOISE LEVELS DUE TO RAIL YARD FACILITIES AND CORRIDORS
(Levels in L_{dn} (dBA))

Receptor Number	Residential Area	Railroad Noise Source Under Proposed Project	1979 Existing	No Build	Two-Yard	Three-Yard Directional	Three-Yard Bidirectional
150	National City	Expanded Madison Yard	57	57	64	(1)	(1)
151	Brooklyn	Madison & New Yards	61	62	60	58	58
152	Brooklyn	Madison & New Yards	61	62	56	55	55
153	Brooklyn	Madison & New Yards	62	63	60	59	59
154	Brooklyn	Madison & New Yards	64	65	63	62	62
155	Brooklyn	Madison & New Yards	64	65	64	58	65
156	Brooklyn	Madison & New Yards	63	64	62	59	59
157	Venice	Madison Yard	66	67	61	60	60
158	Venice	Madison Yard	65	66	59	58	58
159	Venice	Merchants Bridge Corridor	76	77	69	68	69
160	North Venice	Willows Corridor	62	62	62	65	65
161	North Venice	Willows Corridor	54	54	61	64	64
162	Madison	Willows Corridor	77	77	75	77	78
163	East St. Louis	MacArthur Corridor	78	80	78	78	79
164	East St. Louis	MacArthur Corridor	65	66	65	65	66
165	East St. Louis	Willows Corridor	65	62	60	61	57
166	East St. Louis	MacArthur Corridor	77	80	78	79	79
167	East St. Louis	MacArthur Corridor	70	72	66	67	66
168	East St. Louis	MacArthur Corridor	63	63	63	64	62
169	East St. Louis	Q Corridor	64	65	67	67	64
170	East St. Louis	Gateway Yard	69	69	71	71	71
171	East St. Louis	Willows Corridor	69	68	63	63	59
172	East St. Louis	Gateway Yard	70	70	72	73	72
173	East St. Louis	Gateway Yard	64	65	66	67	61
174	East St. Louis	Gateway Yard	65	66	60	61	60

NOTES: (1) Receptor to be relocated under this alternative.

TABLE 2

PREDICTED RECEPTOR NOISE LEVELS DUE TO RAIL YARD FACILITIES AND CORRIDORS
(Levels in L_{dn} (dBA))

(Continued)

Receptor Number	Residential Area	Railroad Noise Source Under Proposed Project	1979 Existing	No Build	Two-Yard	Three-Yard Directional	Three-Yard Bidirectional
175	Centreville	Gateway Yard	61	63	61	62	61
176	Centreville	Gateway Yard	61	62	58	58	58
177	Centreville	Gateway Yard	57	57	(1)	(1)	64
178	Centreville	Gateway Yard	57	57	59	59	61
179	Centreville	Gateway Yard	57	57	(1)	(1)	57
180	Centreville	Gateway Yard	57	57	(1)	(1)	58
181	Centreville	Gateway Yard	57	57	61	61	61
182	Centreville	Gateway Yard	57	57	(1)	(1)	60
183	Centreville	Gateway Yard	57	57	(1)	(1)	57
184	Centreville	Gateway Yard	57	57	(1)	(1)	60
185	Centreville	Gateway Yard	57	57	58	58	55
186	Centreville	Gateway Yard	57	57	54	54	53
187	Centreville	Gateway Yard	57	57	(1)	(1)	61
188	Centreville	Gateway Yard	57	57	58	58	59
189	Centreville	Gateway Yard	57	57	52	53	54
190	Centreville	Gateway Yard	57	57	55	56	55
191	East St. Louis	TOFC Yard	61	62	65	65	65
192	East St. Louis	TOFC Yard	59	60	65	65	65
193	East St. Louis	Rose Lake Corridor	73	73	71	72	72
194	East St. Louis	Rose Lake Corridor	73	73	71	72	72

NOTES: (1) Receptor to be relocated under this alternative.
(2) All predicted noise levels include noise reductions due to proposed barriers and landscaping.

equipment noise. After January 1, 1985, the noise levels at or beyond a hump yard boundary line would not be permitted to exceed an L_{dn} of 65 dBA at any receiving residential or commercial property. The dBA are a unit of noise measurement, decibels, measured on the so-called "A" scale. The scale runs from 1 (the faintest sound perceptible to most humans) to about 130. The scale is logarithmic, so that each 10 decibel increase represents a doubling of sound (e.g. 65 dBA is twice as loud as 55 dBA).

Since noise from rail or highway traffic fluctuates with time and traffic volume, it is common practice in noise measurement to calculate an average sound level over an hour. This measure is called the equivalent sound level and is symbolized L_{eq}. The L_{dn}, or day-night level, is a 24-hour average sound level in which noise levels occurring between 10 p.m. and 7 a.m. are increased by 10 dBA (i.e. doubled) before calculating the 24-hour average, in order to account for the increased sensitivity of people to noises at night. The proposed property line standard would establish federal regulations limiting noise emitted from railyard facilities which are not covered by specific source standards. Conflicting state and local regulations would be preempted. Special limitations would be imposed in situations where railyard noise is not the dominant component of the total noise environment. Through trains and mainline corridors would not be regulated by these property line standards.

Mainline corridor traffic would not be regulated under any property line standard. Current noise standards specifically limit noise emissions from locomotives and rail cars operated by interstate carriers. The standards specify maximum noise levels for moving and stationary locomotives operating at various throttle settings. The standard requires all locomotives manufactured after December 31, 1979 to meet the specified limits.

The property line standard of 65 L_{dn} has been deferred by EPA. The agency is currently investigating additional information and comments and

is considering several changes from the proposal. EPA is committed by court order to issue a property line standard in the future. The earliest date would be May 23, 1981. However, standards for several specific noise sources within railyards have been issued.

On January 4, 1980, the Environmental Protection Agency published in the Federal Register (45 FR 1252) the Noise Emission Standards for Transportation Equipment; Interstate Rail Carriers. The effective date for these regulations is January 25, 1984. Four specific railyard noise sources were regulated: active retarders, locomotive load cell test stands, car coupling, and switcher locomotives.

- The sound levels from a stationary switcher locomotive or any combination of stationary switcher locomotives should not exceed 65 dBA at a residential or commercial receiving property. If this property line standard is exceeded at any time, all switcher locomotives in the yard must meet specific standards applied at a distance of 100 feet from each locomotive under various operating modes.

- The locomotive load cell test stand is limited to 78 dBA at 100 feet only if the noise level at any receiving property exceeds 65 dBA during the period of operation.

- The maximum average noise level from active retarders over a specified time period will be limited to 83 dBA at the receiving property line.

- The adjusted average maximum sound level for car coupling operations may not exceed 92 dBA at any receiving property measurement location. If the railroad could show that the coupling occurred at speeds of eight miles per hour or less for those couplings with sound levels greater than 92 dBA, car coupling is deemed to be in compliance with the standard.

The Illinois Environmental Protection Agency (IEPA) has issued the State of Illinois Noise Pollution Control Regulations specifying the maximum allowable octave band sound pressure levels for any receiving property. The IEPA standards would apply to any residential area located near a rail yard in the project area. However, methods for predicting the octave band levels from railroad sources are not available. The typical noise spectrum for a diesel-electric locomotive is centered between 30 and 150 Hertz (Hz). Hertz are units which express the frequency or the wave lenth

of a sound, measuring the number of cycles per second characteristic of the particular sound. The noise emitted from a master retarder is in the 2000 to 4000 Hz range (3). The noise impacts were analyzed in terms of L_{dn} (dBA), which combines the octave band sound pressures into one number.

Measurement of Existing Noise Levels

The existing noise levels were measured at seven of the major residential areas which were selected for analysis in the previous section. The purpose of these noise measurements were to characterize the existing noise levels at the developed land uses adjacent to the expanded railyard facilities, to calibrate and verify the predictive model, and to provide a baseline for impact analysis. The individual sample sites selected were the "worst case" locations that would most likely receive the greatest potential impacts under the proposed project.

Each noise monitoring sample consisted of taking 2,000 samples at one second intervals, resulting in a 33-1/3 minute continuous sample. The noise monitoring equipment and sampling procedures are given in detail in Appendix I-B.

The L_{eq} values measured at each area at different periods of the day are given in Table 3. Multiple samples were taken to characterize the variation in the community noise environment at different periods of the day and from one day to another, in order to obtain an average value that was not influenced by any atypical noise source.

The L_{dn} levels were then calculated from the measured samples. The noise measurements between 7 a.m. and 10 p.m. at each site were averaged to determine the daytime noise level. If no samples were taken between 10 p.m. and 7 a.m., the nighttime noise level was assumed to be equal to the lowest daytime measurement at each receptor.

The L_{dn} noise levels due to railroad facilities were also predicted at each site and are presented in Table 3. These values are based on the

TABLE 3

EXISTING L_{dn} NOISE LEVELS, MEASURED MAY-JULY 1979

Area Number	Community	Sampling Location	Predominant Land Use	Significant Noise Sources	Measured L_{dn} (dBA)	Predicted L_{dn} (dBA)	Measured Leq (dBA) Noise Levels (a)			
							Morning 7am-Noon	After-Noon 1pm-5pm	Evening 7pm-10pm	Night 10pm-7am
3	Madison	State & 2nd Streets	Residential & Commercial	Railroad Tracks: 120 ft State Street: 80 ft	70	71	76	68,65	58	56
4	Venice	7th & Jefferson Streets	Residential	Madison Yard Tracks: 430 ft Master Retarder: 700 ft	63	66	59	58,53	54	56
6	Brooklyn	8th & Washington Streets	Residential	ICG Rail Tracks: 900 ft	59	64	53	52	(b)	(b)
9	Fairmont City	45th Street & Cookson	Residential	45th Street: 40 ft Rose Lake Corridor: 600 ft	59	54	52	54	(b)	(b)
10	East St. Louis	20th Street & Central Avenue	Residential	20th Street: 40 ft Railroad Tracks: 150 ft	73	71	66	68	66	(b)
11	East St. Louis	Piggot Avenue, Between 33rd & 35th Streets	Residential	Gateway Yard Tracks: 600 ft Group Retarder: 1,100 ft	63	62	56	57	(b)	(b)
12	Centre-ville	Baker Avenue & 43rd Street	Residential	No major sources observed	58	56	52	52	53	(b)

NOTES: (a) Continuous 33 1/3 minute samples
(b) No measurement taken during this time period

Granite City is currently exposed to excessive noise from the Q and A&S Corridors. East St. Louis is affected by railroad noise from the Willows, MacArthur Bridge, A&S, and Q Corridors. The MacArthur Bridge and A&S Corridors impact the most people, who may be exposed to noise levels of 83 dBA L_{dn} at the closest receptor (#51).

Cahokia and Dupo are currently exposed to noise levels as great as 80 dBA L_{dn} from the Willows Corridor (#84-98). Few residences (#104, 105, 106) in East Carondelet are currently exposed to significant railroad noise, due to the small amount of rail traffic on the Dupo By-Pass.

Noise levels from existing Gateway and Madison yard facilities affect a smaller number of residences than those from the corridors. Several residences are exposed to noise in Venice (#157, 158) from the Madison Yard, and in areas of East St. Louis surrounding the Gateway Yard (#170, 172, 173, 174). Noise from the Gateway Yard is not currently excessive in Centreville, where the ambient noise levels range from 57 to 61 dBA L_{dn}.

PROJECT EFFECTS

The probable impacts of the proposed MARGE project on the noise environment were estimated by prediction of the 2000 design year railroad noise levels. The predicted levels were then compared with the existing levels to determine increases and decreases in sound.

Predicted Noise Levels

The railroad-generated noise levels were predicted with the use of a computer model based on the data and methodologies presented in USEPA's Background Document for Final Interstate Rail Carrier Noise Emission Regulation: Source Standards (1) and Background Document for Railroad Noise Emission Standards (4), and in the Wyle Laboratory's Assessment of Noise Environments Around Railroad Operations (3). The calculated 24 hour L_{dn} noise levels emitted from each railroad noise source are a function of the maximum noise levels, exposure time duration, number of events, and distance. A detailed explanation of the modelling approach, equations, and assumptions is outlined in Appendix D of this report.

The noise model was calibrated and verified for 17 train pass-bys on corridor main line operations in the project area. Details of the analysis and results are given in Appendix C. Overall, the measured and predicted noise levels for an individual train pass-by differed by an average of 3 dBA. The community noise levels due to railroad noise sources were predicted for seven locations, and can be compared to the corresponding measured existing noise levels presented in Table 1 in the previous section.

The input data used for all noise level calculations are given in Appendix A. The railroad traffic parameters are typical average values for a 24 hour day. All yard operations were assumed to operate continually around the clock, when the nighttime activity level is the same as during the daytime.

The predicted noise levels due to railroad operations at the 194 receptors are listed for each alternative in Tables 1 and 2. The proposed barrier mitigation for the three build alternatives has been included in these predicted noise levels. The types and locations of the barriers are illustrated on the Figures in Appendix II.

The predicted noise levels were calculated from railroad noise sources only. No attempt had been made to model noise caused by local automobile traffic and other community activities. The predicted values are useful to compare the noise impacts due to changes in railroad operations.

Where no dominant railroad noise source is present, the existing noise environment is due primarily to local automobile traffic. The L_{dn} may be estimated based on population density by the equation $L_{dn} = 10 \log P + 22$, where P is the population density in people per square mile (10).

This formula was used to estimate the L_{dn} levels at Centreville in Table 2. For an urban area like Centreville with a population density of 2,900 per square mile, the L_{dn} was estimated to be 57 dBA. The field measurement of the existing noise level in Centreville, discussed in the previous section, was an L_{dn} of 58 dBA.

Comparison with Existing Noise Levels

The noise levels due to the proposed project were compared to existing levels and to those likely to be reached in the same location if the project were not built. Noise impacts can be expected if the predicted noise levels appear significantly higher than the existing levels, or if any federal, state, or local property line noise standards would be exceeded. For a residential area typical of those in the project area with an L_{dn} in the 55-60 dBA range, a change of 10 dBA would be major and a change of 5 dBA minor. A difference of 10 dBA would make a sound seem twice or half as loud, while a change of 3-4 dBA over a period of time would be seldom noticed.

Table 4 lists the estimated number of residences within the project area where the L_{dn} due to railroad noise sources would be expected to exceed 65 dBA. The L_{dn} of 65 dBA represents a conservative assessment of noise impacts, and corresponds to the proposed USEPA property line standard for hump yards. The 65 dBA noise contour line was drawn on aerial photographs of the project area and the number of residences were counted. This analysis is useful in determining the magnitude of noise impacts under each alternative. The noise reductions resulting from the proposed noise barrier mitigation have been included in the calculations used for Table 4.

The predicted railroad-generated noise levels were analyzed and compared for the 13 major areas or groupings of receptors along the project length shown in Exhibit B. All of the areas analyzed were residential land uses since they represent the greatest potential for noise impact.

- Area 1 - Granite City and Mitchell

  There would be no significant differences from existing noise levels along the A&S and Q Corridors under any of the alternatives; however, the number of residences impacted under the Three-Yard Bidirectional Alternative would be greater than under the other alternatives.

- Area 2 - North Venice

  There would be no significant differences from existing noise levels along the Willows and Q Corridors in the area of North Venice. Noise levels would decrease by 5 dBA at receptors along the Merchants Bridge Corridor (# 141, 143).

- Area 3 - Madison

  A significant noise source in this area is automobile traffic on State Street. The rail traffic along the Willows Corridor from WR to SH Tower would decrease and thus lower noise levels by about 6 dBA under all of the build alternatives. However, the hump engine activity from the New Yard under the Three-Yard Directional and Bidirectional alternatives would increase noise levels by about 7 dBA. (Refer to receptor # 162 in Table 2.) The number of residences exposed would increase under the two Three-Yard Alternatives.

Table 4: Estimated Number of Residences Exposed to Railroad Noise Levels Greater than L_{dn} = 65 dBA

Area Number	Community	Railroad Source	1979 Existing	No-Build	Two-Yard	Three-Yard Directional	Three-Yard Bidirectional
1	Granite City & Mitchell	Q Corridor	141	70	74	74	136
		A&S Corridor	25	22	15	15	19
2	North Venice	Merchants Bridge	5	6	0	0	0
		Q Corridor	30	25	36	40	40
3	Madison	Willows Corridor	28	26	56	113	118
4	Venice	Madison Yard	6	14	0	0	0
		Q Corridor	17	14	20	21	21
		Merchants Bridge	53	67	11	5	5
5	Venice Township	Madison Yard	0	0	0	0	0
6	Brooklyn	Madison Yard	0	11	0	0	0
7	National City	Madison Yard	0	0	0	(a)	(a)
8	East St. Louis	Q Corridor	60	60	85	85	60
		MacArthur Bridge	260	360	260	260	330
		Willows Corridor	180	160	98	98	56
		Rose Lake	20	31	70	63	56
		A&S Corridor	254	112	65	65	60
9	Fairmont City, Alorton & Washington Park	Rose Lake	0	0	0	8	8
		A&S Corridor	147	131	52	52	52
10	East St. Louis	Gateway Yard & MacArthur Approach	46	90	24	33	28
11	East St. Louis	Gateway Yard	27	49	80	90	58
12	Centreville	Gateway Yard	0	0	0	0	0
13	Cahokia, Dupo & East Carondelet	Willows Corridor	281	335	304	329	362
		Dupo By-Pass	4	4	47	55	34
Total number of residences under each alternative			1584	1587	1297	1409	1443
% change from 1979 existing conditions			-	0	−18	−11	−9

Notes: (a) to be relocated under this alternative

- Area 4 - Venice

  Noise levels would increase in areas of Venice close to Madison Yard (#157, 158) under each of the build alternatives. However, a buffer strip and green belt is proposed to mitigate these impacts and would result in a net decrease in noise levels. Noise levels along Merchants Bridge Corridor (#159) in Venice would decrease by 8 dBA, but would change little at receptors along the Q Corridor (#12, 13).

- Area 5 - Venice Township

  The residential areas of Venice Township are located at a distance greater than 1,000 feet from the Madison Yard, where noise levels from the yard would not be significant. The Illinois Terminal tracks south of the area would be removed under the project. No residences are currently exposed to railroad noise levels greater than an L_{dn} of 65 dBA, nor would any be under the project.

- Area 6 - Brooklyn

  The residential areas of Brooklyn would be significantly impacted under the proposed project. Existing background community L_{dn} levels were predicted to be in the range of 61 to 64 dBA in Brooklyn. Under the Two-Yard, Three-Yard Directional, and Bidirectional Alternatives, the predicted L_{dn} noise levels would range from 68 to 74 dBA at the closest receptor site in Brooklyn (# 155). The increase would be due to the pull engines operating out of Madison Yard.

  However, proposed mitigation can reduce the impacts. Under the Two-Yard Alternative, a wall is recommended as a barrier (due to the limited land available for a berm) to lower the noise levels at the public housing area of Brooklyn adjacent to the yard. Under the Three-Yard Directional and Bidirectional Alternatives, a berm and wall combination and the use of absorptive barriers along the retarders of New Yard would lower property line noise levels. The effective height of the barriers will be about 15-20 feet. The area would also have appropriate landscaping for erosion and aesthetic purposes. The number of residences in Brooklyn exposed to noise levels greater than 65 dBA L_{dn} would than be zero under each build alternative.

- Area 7 - National City

  The noise levels in National City would increase by 7 dBA at the "worst case" receptor (#150) under the Two-Yard Alternative. Barriers are proposed to mitigate the impacts.

Under the Three-Yard Alternatives, the adverse noise impacts at National City would be eliminated due to the relocation of National City housing.

- Area 8 - East St. Louis

The proposed TOFC site along the Willows Corridor would increase noise levels by 3 dBA at receptor numbers 190 and 191. The noise levels at receptors along the Willows Corridor (#67-78) would decrease by 4 dBA, while the noise levels at receptors along Q Corridor (#3, 4, 5, 7 and 9) would increase by 3 to 4 dBA. Noise levels would decrease by 7 dBA along the A&S Corridor (#50-54).

- Area 9 - East St. Louis, Fairmont City, and Washington Park

The overall noise levels would decrease by 3 to 6 dBA under all of the build alternatives for receptors located along the A&S Corridor(#50-58). Noise levels would increase by 2-5 dBA at receptors along the Rose Lake Corridor (#108-120).

- Area 10 - East St. Louis

The residential area west of the existing Gateway Yard facility would not receive greater railroad noise levels under any of the alternatives. A proposed green belt buffer would lower railroad noise at receptor number 167. A significant noise source at this site is the tractor trailer traffic on 20th Street, which would not be affected under the proposed project. Noise levels along the MacArthur Bridge approach and Q Corridor would change by ± 2 dBA.

- Area 11 - East St. Louis and Alorton

The noise levels at receptors north of the Gateway Yard (#170-174) would change by $\pm$ 4 dBA. The number of residences impacted would increase under each of the build alternatives.

- Area 12 - Centreville

Centreville would receive noise impacts from the proposed project, due to the expansion of Gateway Yard into the residential area under the all of the build alternatives. The existing background noise levels within Centreville were predicted to be 57 dBA L_{dn}. The predicted noise levels at receptors adjacent to the yard would increase by 14 dBA. This significant increase is a result of up to 100 freight trains per day travelling around the perimeter of the yard as they enter or leave Gateway Yard.

The difference in noise levels at Centreville among the three build alternatives is minor. Noise levels under the Three-

Yard Bidirectional Alternative would be slightly lower, due to the greater amount of open land between the yard expansion and residential receptors. Barriers are recommended around portions of Gateway Yard for all of the three build alternatives, and would lower the noise to the levels listed for receptors 175-190 in Table 2. With adequate mitigation, no residences would be exposed to noise levels greater than an L_{dn} of 65 dBA.

A combination berm and wall would lower noise levels up to 10 dBA at an estimated cost of $200 per linear foot. Since a locomotive exhaust port is 15 feet high, a wall in the range of 15 to 20 feet effective height is necessary. In addition, absorptive barriers would be built around the master and group retarders. The combination berm and wall, absorptive barriers and a 200 foot right-of-way would lower property line noise levels to lessen impacts in Centreville and meet any current or anticipated noise standard.

o <u>Area 13 - Cahokia, Sauget, and Dupo</u>

Noise levels would increase significantly for sensitive receptors located along the Dupo By-Pass (#99, 100,104-107) by as much as 16 dBA. The residential areas of greatest impact would be Cahokia, Dupo, and East Carondelet.

Route 3 Relocation

The segment of Route 3 north of Interstate 55/70 to the Merchants Bridge at Venice would be relocated under all build alternatives in order to bypass either the expanded Madison (Two-Yard) or the New Yard (both Three-Yard Plans). The two-lane section of Route 3 would be relocated, with provision for eventual widening into a limited-access, four-lane highway. Three design alternatives will be evaluated, differing in the alignment of the highway and the location of the Brooklyn interchange. Alternative 1 would be on the west side of the "Q" rail corridor, and is called the West Plan; Alternative 2 would be located on the east side of the railroad, and is therefore called the East Plan; and Alternative 3 would provide two lanes on each side of Q Corridor, and is therefore called the Split Plan. The alignments all fit into a corridor only 500 feet wide.

The average daily traffic (ADT) on this section of Route 3 currently ranges between 4700 and 6600 vehicles per day. Traffic is expected to increase to 12000 - 13000 vehicles per day by the year 2000. All three relocation alternatives have been designed to be expandable to handle 15000 vehicles per day to insure adequate capacity.

For the purposes of calculating existing noise levels for Route 3 traffic, the peak hourly traffic volumes were assumed to be 8% of the total ADT. The present speed limit is 35 miles per hour. Design speed for the relocated facility would be 50 mph for all alternatives. The vehicle mix is currently 86% automobile, 5% medium trucks and 9% heavy trucks and was assumed to remain the same for all build alternatives. Noise levels were predicted at four receptor sites using the FHWA's Highway Traffic Noise Prediction Model (5) based on the peak hourly traffic volume. Predicted maximum hourly noise levels are given in Table 5. Noise contours for relocated Route 3 are shown on the Exhibits included in the Relocation of Route 3 Technical Supplement and in the EIS.

TABLE 5: Noise Levels Due to Route 3 Relocation

Site Number	Community	Receptor Location	1979	No Build 2000	West Plan	East Plan	Split Plan
1	National City	Cahokia St. & Route 3	70	74	53	55	54
2	Brooklyn	Jefferson St. & Route 3	67	71	66	71	68
3	Venice	Route 3 & Kerr St.	69	73	59	57	58
4	Venice	2nd St. & Ashbrook St.	51	55	66	68	67

Note:

*Measured on the L_{eq} dBA scale, which is decibels on the "A" scale. The maximum acceptable external noise level for residences is 67 dBA L_{eq}.

A major noise impact is defined as a change of 10 or more dBA in the noise level, or a violation of the design noise levels. The maximum acceptable external noise level for residences is 67 dBA L_{eq}, as specified in the Federal-Aid Highway Program Manual, Volume 7, Chapter 7, Section 3 (FHPM 7-7-3).

The noise levels at all existing residences in National City (Site 1) would decrease by 19 to 21 dBA under all design alternatives since Route 3 would be relocated approximately 1000 feet away from the town. The noise levels in Brooklyn (Site 2) would exceed the design noise levels by 1 to 4 dBA if either the East Plan or the Split Plan were constructed or if Route 3 remained in its current location and the No-Build Restructuring Alternative were selected. The West Plan would lower noise levels by 5 dBA to an L_{eq} of 66 dBA, since Route 3 would be located some 300 feet further from the residential area of Brooklyn. The noise levels in Venice (Site 3) along the existing Route 3 would decrease by 14-16 dBA under all designs.

The noise levels in western Venice along 2nd Street (Site 4) would increase by 11-13 dBA under all alternatives. The noise levels under the West Plan would be slightly lower, since Route 3 would be relocated at a greater distance from most of the town's residences.

Construction Noise Impacts

All existing land uses and land use activities immediately adjacent to the proposed project are likely to receive excessive noise during the construction period of the project.

Trucks produce the most construction noise because they are used for long periods of time and are not confined to the site. Bulldozers, air compressors, drills, generators, and other tools combine to increase the noise output. Noise levels in the range of 70-95 dBA are typical at 100 feet.

Any residence adjacent to an expanded yard, corridor modification, or interlocking would be exposed to short-term noise impacts due to the construction of the project. Areas of Venice, Brooklyn, East St. Louis, and Centreville would receive noise from the construction of the railyard facilities, which would involve a much larger and longer lasting construction period. Other communities within the project area would be exposed to noise levels from the modification of the corridors.

Comparison with Standards

All four of the specific railyard source standards would be met under the proposed project. The locomotive load cell test stands and idling switcher locomotives would be located away from residential areas around Gateway, Madison, and New Yards. Coupling noise would not be a problem. The use of absorptive barriers around the active master and group retarders would lower the maximum noise levels below the standard.

The property line standard of an L_{dn} of 65 dBA would be met at all receptors in Brooklyn, Venice, and Centreville with the construction of the appropriate barriers under the proposed project.

All residential areas adjacent to rail yards in the project area would be protected from excessive railroad noise by the proposed barriers. These mitigation measures are the best practical and economic control methods available and should minimize any potential violations of the existing IEPA noise standards.

Summary

Noise emitted from corridor or main line operations would not significantly increase at a majority of the receptors analyzed. A doubling or halving of rail traffic volume would change noise levels by only ± 3 dBA. Overall there would be no major differences in noise levels along corridors among the three build alternatives. However, much of the residential land use adjacent to the corridors would continue to receive noise levels greater than L_{dn} of 65 dBA.

VIBRATION

Vibration levels resulting from railroad operations are generated at the wheel and rail interface. Vibrations from at-grade track are then transmitted to a building's walls through both the ground and the air. The walls and floors may vibrate and radiate secondary noise inside the buildings (7,8).

Ground vibration is transmitted directly through the soil from the track to adjacent buildings. Airborne vibration may cause window rattles as a result of the low frequency pulses from locomotive exhausts. The ground vibration levels due to a passing train decrease rapidly with greater distance, where the ground component becomes a lesser importance.

Analytical means to predict the ground vibration levels near railroad lines do not exist (8). Vibration impacts can only be generalized for the proposed project. The vibration impacts resulting from corridor operations would be small. Vibration levels at buildings located extremely close to tracks would increase slightly under the build alternatives, due to higher train speeds. However, the lower number of trains per day expected on some corridors would decrease average daily vibration levels.

Since wheel and rail conditions are known to have a large effect on ground vibration levels, a large reduction in vibration can be expected from the use of welded rails (8). All new track built under the proposed project would use welded rail instead of jointed rail. Thus vibration levels would decrease at buildings located near the improved sections of the corridors and all new yard tracks.

Buildings in Centreville and Brooklyn adjacent to the expanded rail yard facilities would be subjected to vibration. The proposed berm and wall barriers should reduce the airborne vibration levels, and the 200-foot buffer zone would attenuate the ground vibration. No other mitigation methods are practical.

ALTERNATIVE NOISE ABATEMENT MEASURES

Noise abatement measures that will reduce or eliminate railroad noise impacts to sensitive receptors and land uses were investigated. Current and anticipated noise standards may require mitigation of noise levels at the property line of railyards. In addition, the achievement of lower noise levels would benefit the health and welfare of the local communities within the project area regardless of standards.

Noise abatement measures are normally confined within the railroad right-of-way. Typical measures of abating railroad noise considered to be included in the project are: operational procedures, barriers, mechanical design, and land use controls.

Noise Abatement by Operational Procedures

Since railroads are reluctant to shut down locomotives overnight, idling locomotives should be parked near the center of a railyard or away from nearby residential areas. Diesel service and repair facilities should also be constructed away from sensitive receptors since idling switchers and load cell test stands are regulated by current USEPA yard noise standards. The diesel service and repair facilities of Gateway and New Yards would be located away from residential receptors under each of the proposed design alternatives.

Practical approaches to reducing car coupling noise in railyards are currently limited to keeping car speeds at minimum levels required for coupling and to reducing night time classification operations in residential areas. It is estimated that eliminating speeds in excess of 6 mph would reduce A-weighted average maximum levels 1 to 2 dBA; while restricting coupling speeds to less than 4 mph would reduce levels by 7 to 8 dBA (1). The use of efficient equipment and maintenance procedures along with an improved yard configuration would decrease coupling speeds close to 4 mph, thus lowering the property line noise levels and complying with current USEPA car coupling noise standards.

Barriers

Structural barriers and earth berms can minimize adverse noise impacts and contribute towards compliance with property line noise standards in many cases. A properly designed noise barrier can reduce noise levels by as much as 10 dBA, a difference that would seem half as loud to the average listener. Barriers available to reduce railroad noise emissions are: absorptive retarder barriers, earth berms, and a combination of earth berm and wall barriers.

Absorptive barriers have effectively reduced retarder squeal at the Madison Yard in Venice. These barriers are 12 feet high and consist of 4-inch thick fiberglass absorptive material. A barrier is placed on both sides of the master and on each of the individual group retarders. Noise measurements before and after barrier installation showed that the noise levels were reduced up to 25 dBA (1).

Absorptive noise barriers 12 feet high by 150 feet long along both sides of the master and group retarders are expected to reduce noise levels in the receiving property areas in the range of 16 to 22 dBA and should provide sufficient abatement to meet the current USEPA retarder noise standard. Initial material and installation costs are estimated to be $162 per linear foot (1). Construction is of a heavy backing panel, faced with acoustical material, and then surfaced with a perforated or expanded metal covering.

Earth berms can reduce noise levels by as much as 10 dBA. Recent data suggests that earth berms provide about 3 dBA more attenuation than reflecting walls. A berm tends to reflect a portion of the noise upward and away from all receptors, and its surface absorbs part of the acoustical energy that strikes it. A berm and wall placed in the general vicinity of the yard boundary next to a receiving property should, in most cases, provide sufficient abatement to meet the proposed property line standard. Berms should be landscaped with sound absorbing materials such as grass or other vegetation with dense root systems to improve their performance as noise barriers and to prevent erosion.

Since locomotive exhaust ports are approximately 15 feet high, berms in the range of 15 to 20 feet effective height are necessary. A combination berm and wall will require less right-of-way than a berm of the same height. A combination berm and wall at the property line will lower noise levels by as much as 10 dBA at a cost of $200 per linear feet.

In areas where the right-of-way is limited, a wall barrier may be the only option. Precast concrete panels are available at a cost of $22 per square foot.

A shallow row of shrubs and trees planted in the area between the railroad and the receptors would be pleasing psychologically and aesthetically, and would provide some noise attenuation. A mature green belt 100 feet deep will lower railroad noise by only 5 dBA at a cost of $77 per linear foot of buffer zone.

The use of absorptive retarder barriers and berm-walls can reduce the noise levels from the expanded railyard facilities in the residential areas of Centreville, East St. Louis, Brooklyn, and Venice. The barriers will enable the railyards to meet the future property line noise standards proposed by EPA. In addition, a properly designed barrier can improve aesthetics by hiding much of the railroad, fence off railroad property, control spills of liquids, confine wrecks, and reduce the danger of fires and explosions.

Barriers should be built prior to other railroad construction activity. The barriers would then minimize the construction noise impacts to nearby residential areas.

Mechanical Design

Squeal from the master and group retarders can be controlled by using ductile iron shoes and a lubrication system. Both will reduce the total number of squeals emitted each day when the cars roll through the retarders. This will lower the 24-hour average noise levels at the property line but is ineffective in lowering the maximum noise levels

emitted when the squeals do occur. Only barriers can significantly reduce the maximum noise levels below the current USEPA retarder noise standards. A lubrication system for a single retarder in a hump classification yard is estimated to cost approximately $250,000. The total annual incremental cost for ductile iron shoes is $67,000 for master retarder modification plus $45,000 for six group retarders (1).

Noise from inert retarders can be totally eliminated by replacing inert retarders with commercially available releasable type retarders. Controlled retarders allow cars to pass freely when the release is activated and are recommended for use in all new yard construction and replacement applications.

The most practical approach to reducing noise from switcher engines operating within railyards is to retrofit the engines with exhaust silencers or mufflers. At high throttle settings exhaust noise is a major contributor to locomotive noise. Maximum noise levels may be reduced by 1 to 5 dBA for a moving switcher. The estimated total capital cost for each switch engine is $12,000, a figure that the railroad industry disputes as underestimating actual costs (1). On the average, the noise level reduction for an idling switcher will be 3 dBA, and 4 dBA for a moving switcher. Mufflers on all captive switch engines operating within the Gateway, Madison, and New Yards could reduce property line noise levels at areas near humping and pull engine activity.

Mufflers that produce 5 to 10 dBA of exhaust muffling are currently feasible for road engines operating on main line corridors. Existing EPA noise standards for interstate rail carriers require mufflers on all locomotives manufactured after December 31, 1979. The net overall locomotive quieting will be about 6 dBA. However, the railroads will be reluctant to absorb the costs of consistently installing mufflers on existing road engines or to operate them in a manner that will minimize noise, regardless of regulations.

Noise and vibration levels from moving rail cars can be controlled by eliminating wheel flats and rail joints, and by maintaining smooth wheel and rail surfaces. The only practical methods available to reduce wheel/rail noise are through the use of welded rail and the maintenance practices of car wheel and rail grinding. The effectiveness of wheel damping, resilient wheels, and rail damping is unknown. A well designed and maintained system can typically lower noise levels by 6 dBA (7).

The use of welded rail for all new track in the project area instead of jointed rail can be expected to reduce wayside noise by as much as 3.5 dBA (4). In those systems using jointed rail, joints should be maintained smooth and tight. All new corridor and yard tracks would use welded rail under the proposed project.

The A-weighted noise levels produced by a train passing over elevated steel structures such as guideways and bridges can be as much as 20 dBA greater than corresponding levels when the train runs at-grade over normal ballasted track. Noise levels from steel plate bridges can be lowered by relaying the track with ballast, however, that would increase the weight that the bridge must support. Noise from both concrete and steel structures has been reduced by damping the structure.

Either method provides 10 to 20 dBA of noise reduction and may be useful for the MacArthur and Merchants bridge approaches. Resilient rails can provide noise reduction in some cases (8).

Land Use Control

The modification of existing land use patterns and the restrictions on future development represent methods of abating or preventing future noise impacts. The acquisition of additional property as part of the project's right-of-way is a means of controlling land use. Those receptors which are projected to be impacted by rail noise could be acquired and their present land use eliminated or restricted to a more noise compatible use. The cost of property acquisition and the necessary

relocation costs for businesses and residents generally makes this aspect of noise abatement control uneconomical, unrealistic, and socially unacceptable.

Noise impacts due to future residential development can be avoided by the consideration of noise in the local planning and zoning of the undeveloped land adjacent to the project. Local municipalities can prepare plans that locate the most susceptible uses away from rail activities and utilize the adjacent land for open space or other less susceptible uses such as buffer zones or physical barriers. This noise report will assist local municipalities by identifying future noise levels; however, implementation of such action is a totally local jurisdictional matter beyond the scope of this report.

Abatement by Modifying the Receptor

Interior noise levels for schools, libraries, churches, hospitals, and nursing homes can be reduced by 10 to 25 dBA by modifying window construction and adding storm sashes. Noise insulation can be cheaper than outright purchase of the property for certain receptors.

Construction Noise Abatement

To minimize or eliminate construction noise impacts on residential areas, the following measures, cited in the State of Illinois' Standard Specifications for Road and Bridge Construction, should be included in the construction plans and specifications:

> All engines and engine driver equipment used for hauling or construction shall be equipped with an adequate muffler in constant operation and properly maintained to prevent excessive or unusual noise. Construction within 1000 feet of an occupied residence, motel, hospital or similar receptor shall be confined to the period beginning at 7:00 a.m. and ending at 10:00 p.m. This time regulation shall not apply to sawing contraction joints as required in Article 408.12 of the Standard Specifications, maintenance or operation of safety and traffic control devices such as barricades, signs and lighting, or to construction of an emergency nature.

The following definitions apply to this construction noise minimization measure:

> Adequate Muffler - An "adequate muffler" is one which is equal to or quieter than the original muffler. If there has been no original muffler, it should be a muffler recommended by the engine manufacturer - not one recommended by a muffler manufacturer or a supply house.
>
> In Constant Operation - The exhaust system should have no cutout, bypass or similar device.
>
> Properly Maintained - Small leaks between the engine exhaust and the muffler exhaust will cause a very large increase in noise.

Furthermore, any machine or device or part thereof which is regulated by or becomes regulated by Federal or State of Illinois or local noise standards shall conform to those standards.

The proposed noise barriers at Brooklyn and Centreville should be built prior to the construction of the expanded Madison, New, and Gateway Yards. The barriers would then minimize the construction noise to the nearby residences.

CONCLUSIONS

No Build Alternative

Railroad noise levels would change little by the year 2000 if no action were taken. Approximately the same number of residences would be affected as were in 1979. The communities affected the most would continue to be Granite City, East St. Louis, Alorton, Dupo and Cahokia. The number of residences impacted would decrease in Granite City, while they would increase in Cahokia and Venice.

The noise levels would differ by 1-4 dBA at most receptors, a change that would not be noticed by most residents over a period of time (3).

Two Yard Alternative

The proposed Two Yard Alternative would reduce by 18% the total number of residences affected by railroad generated noise. The overall reduction would be a result of the increased efficiency of corridor traffic routing and of the noise barriers to be constructed under the proposed project.

The greater efficiency would decrease the number of trains per day on many corridor segments, resulting in a lower average daily noise level. Those residential areas along corridors that would experience positive impacts are in Granite City, Alorton, Washington Park, and East St. Louis. The L_{dn} noise levels would decrease by 1-7 dBA at worst case receptors within those communities.

However, the noise levels would increase by 10-16 dBA at residental receptors along the Dupo By-Pass in Dupo, Cahokia and East Carondelet. Over 100 additional residences would be exposed to noise levels greater than an L_{dn} of 65 dBA.

The proposed noise barriers would mitigate the noise impacts in the areas of Venice, Brooklyn, East St. Louis, National City, and Centreville that

are located adjacent to the expanded rail yard facilities. Noise levels in Venice and Brooklyn along the Madison Yard would be reduced by 1 to 6 dBA from the existing noise levels.

Three Yard Directional Alternative

The number of residences exposed to railroad generated noise levels greater than an L_{dn} of 65 dBA would decrease from approximately 1584 to 1409 (11%) within the project area. Improvements in mainline traffic routing and the construction of noise barriers would reduce the overall impacts. The noise level reductions would be in areas of Alorton, East St. Louis, Venice, Brooklyn, and Washington Park, while the noise levels would increase in portions of East Carondelet, Dupo, Cahokia, Madison, and East St. Louis.

The noise levels at receptors along the A&S Corridor in East St. Louis, Alorton, and Washington Park would decrease by as much as 10 dBA. Noise levels would be reduced by 8 dBA south of the Merchants Bridge Corridor in Venice. Those areas of East St. Louis along the Willows Corridor would experience noise reductions ranging from 1 to 6 dBA.

However, the noise levels would increase along several corridors that would be travelled more frequently. The number of impacted residences in Madison along the Willows Corridor and the New Yard hump lead would increase from approximately 28 to 113. The noise levels in East St. Louis along the Rose Lake Corridor would increase by up to 9 dBA, and the noise levels in Cahokia, Dupo, and East Carondelet along the Dupo By-Pass would increase by as much as 11 dBA at the closest receptor.

The noise barriers and buffers proposed to be constructed along the residential areas of Brooklyn, Venice, East St. Louis, and Centreville would mitigate the noise impacts due to the expanded rail yard facilities. Noise levels in Venice and Brooklyn adjacent to the Madison Yard would decrease by as much as 7 dBA from the current noise levels from the existing Madison Yard.

Three Yard Bidirectional Alternative

The proposed Three Yard Bidirectional Alternative would reduce by 9% the number of residences that are exposed to railroad generated noise levels greater than an L_{dn} of 65 dBA. The reductions would be in the residential areas of Venice, East St. Louis, Alorton, and Washington Park.

Noise levels would decrease by 5 to 10 dBA along the A&S Corridor in East St. Louis, Alorton, and Washington Park. Residences in East St. Louis along the Willows Corridor would experience noise reductions up to 10 dBA. Noise levels in the area of Venice south of the Merchants Bridge Corridor would decrease by 7 dBA.

The noise levels in areas of Brooklyn and Venice that are adjacent to the rail yards would decrease by 1 to 7 dBA, due to the construction of noise barriers along the Madison and New Yards. The noise barriers would mitigate the impacts in Centreville next to the expanded Gateway Yard.

The number of residences impacted would increase in areas of Madison and East Carondelet. Noise levels would increase by 9 dBA in East Carondelet along the Dupo By-Pass. The number of residences exposed to railroad generated noise levels in Madison along the Willows Corridor and New Yard hump leads would also increase.

REFERENCES

1) EPA, December 1979. Background Document for Final Interstate Rail Carrier Noise Emission Regulation: Source Standards, EPA 550/9-79-210, Office of Noise Abatement and Control, Washington, DC.

2) EPA, March 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, EPA 550/9-74-004, Office of Noise Abatement and Control, Washington, DC.

3) Swing, Jack W. and Donald B. Pies, July 1973. Assessment of Noise Environments Around Railroad Operations, Wyle Laboratories, Contract No. 0300-94-07991, Report No. WCR 73-5, El Segundo, California.

4) EPA, December 1975. Background Document for Railroad Noise Emission Standards, EPA-550/9-76-005, Office of Noise Abatement and Control, Washington, DC.

5) FHWA, December 1978. FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, Federal Highway Admin., U.S. Dept. of Transportation, Washington, DC.

6) Anderson, G. S., et al, June 1973. Fundamentals and Abatement of Highway Traffic Noise, Bolt, Beranek and Newman, Inc., Cambridge, Massachusetts, PB-222 703.

7) Kurzweil, Leonard G., and Lotz, Robert, September 1978. Prediction and Control of Noise and Vibration in Rail Transit Systems, Transportion Systems Center, Cambridge, Massachusetts, PB-294 968.

8) Manning, J. E., R. G. Cann and J. J. Fredbert, April 1974. Prediction and Control of Rail Transit Noise and Vibration - A State-of-the-Art Assessment. U.S. Department Transportation, Washington, DC PB-233 363.

9) Wisleder, Dean, 1977. Traffic Noise and Vibration Manual, Illinois Department of Transportation.

10) National Academy of Sciences, 1977. Guidelines for Preparing Environmental Impact Statements on Noise, Report of Working Group 69 on Evaluation of Environmental Impact of Noise, Committee on Hearing, Bioacoustics, and Biomechanics, National Research Council, Washington, DC.

Appendix I

APPENDIX A

CORRIDOR INPUT DATA

TABLE A1

RAIL YARD INPUT DATA

	Existing 1979	No Build 2000	2 Yard	3 Yard Directional	3 Yard Bidirectional
Gateway Yard					
Cars humped per day	1967	2463	4260	4522	3537
Cuts humped per day	41	54	50	56	48
Pulls per day	32	43	61	63	56
Trains per day around loop	-	-	97	95	95
Trains per day on MacArthur approach, along north boundary	7	5	16	12	12
Madison Yard					
Cars humped per day	1280	1750	2612	1039	1039
Cuts humped per day	32	44	39	31	31
Pulls per day	61	80	84	50	50
New Yard					
Cars humped per day	-	-	-	3401	3427
Cuts humped per day	-	-	-	46	42
Pulls per day	-	-	-	104	97

INPUT DATA FILE: CORRIDOR OPERATIONS, 1979 NO BUILD ALTERNATIVE (COR79)

SEGMENT NUMBER	DAYTIME TRAINS	NIGHTTIME TRAINS	TRAINS PER DAY	LOCOMOTIVES PER TRAIN	SPEED MPH	CARS PER TRAIN
1.	32.	22.	54.	3.	16.	61.
2.	5.	5.	10.	3.	12.	83.
3.	6.	11.	17.	3.	10.	55.
4.	24.	9.	33.	3.	7.	62.
5.	15.	8.	23.	3.	4.	44.
6.	46.	14.	60.	3.	5.	54.
7.	10.	7.	17.	3.	6.	51.
8.	2.	1.	3.	3.	8.	57.
9.	8.	7.	15.	3.	5.	78.
10.	22.	11.	33.	3.	6.	41.
11.	7.	6.	13.	3.	4.	61.
12.	0.	0.	0.	0.	0.	0.
13.	18.	7.	25.	3.	6.	53.
14.	16.	7.	23.	3.	7.	43.
15.	3.	1.	4.	3.	7.	30.
17.	6.	1.	7.	3.	9.	27.
18.	11.	7.	18.	3.	8.	51.
19.	17.	7.	24.	3.	11.	50.
20.	13.	12.	25.	3.	4.	78.
21.	13.	13.	26.	3.	1.	78.
22.	8.	6.	14.	3.	5.	50.
23.	15.	15.	30.	3.	3.	77.
24.	20.	15.	35.	3.	4.	44.
25.	15.	14.	29.	3.	8.	61.
26.	0.	0.	0.	0.	0.	0.
27.	26.	19.	45.	3.	11.	69.
28.	0.	0.	0.	0.	0.	0.
29.	1.	1.	2.	3.	14.	17.
30.	1.	0.	1.	3.	7.	53.
31.	26.	16.	42.	3.	16.	75.
32.	0.	0.	0.	0.	0.	0.
33.	7.	5.	12.	3.	7.	61.
34.	10.	7.	17.	3.	9.	59.
35.	2.	1.	3.	3.	4.	25.

INPUT DATA FILE: CORRIDOR OPERATIONS, 2000 NO BUILD ALTERNATIVE (CORNB)

SEGMENT NUMBER	DAYTIME TRAINS	NIGHTTIME TRAINS	TRAINS PER DAY	LOCOMOTIVES PER TRAIN	SPEED MPH	CARS PER TRAIN
1.	30.	16.	46.	3.	17.	64.
2.	6.	4.	10.	3.	17.	80.
3.	7.	10.	17.	3.	12.	74.
4.	24.	9.	33.	3.	8.	77.
5.	24.	9.	33.	3.	4.	62.
6.	45.	16.	61.	3.	5.	71.
7.	11.	4.	15.	3.	5.	63.
8.	1.	2.	3.	3.	8.	87.
9.	11.	5.	16.	3.	5.	90.
10.	28.	13.	41.	3.	7.	61.
11.	5.	6.	11.	3.	6.	92.
12.	0.	0.	0.	0.	0.	0.
13.	28.	9.	37.	3.	7.	69.
14.	24.	9.	33.	3.	9.	65.
15.	1.	0.	1.	3.	8.	29.
17.	8.	2.	10.	3.	6.	70.
18.	20.	6.	26.	3.	9.	69.
19.	17.	7.	24.	3.	10.	92.
20.	19.	13.	32.	3.	4.	97.
21.	21.	13.	34.	3.	2.	93.
22.	10.	3.	13.	3.	6.	59.
23.	21.	15.	36.	3.	4.	92.
24.	41.	25.	66.	3.	6.	87.
25.	32.	20.	52.	3.	8.	82.
26.	0.	0.	0.	0.	0.	0.
27.	53.	25.	78.	3.	13.	97.
28.	0.	0.	0.	0.	0.	0.
29.	1.	1.	2.	3.	12.	65.
30.	2.	0.	2.	3.	9.	40.
31.	56.	26.	82.	3.	15.	95.
32.	0.	0.	0.	0.	0.	0.
33.	8.	6.	14.	3.	7.	87.
34.	10.	7.	17.	3.	7.	85.
35.	4.	0.	4.	3.	5.	29.

INPUT DATA FILE: CORRIDOR OPERATIONS, 2 YARD ALTERNATIVE (COR2Y)

SEGMENT NUMBER	DAYTIME TRAINS	NIGHTTIME TRAINS	TRAINS PER DAY	LOCOMOTIVES PER TRAIN	SPEED MPH	CARS PER TRAIN
1.	30.	14.	44.	3.	31.	68.
2.	7.	2.	9.	3.	18.	67.
3.	27.	15.	42.	3.	24.	75.
4.	8.	4.	12.	3.	16.	60.
5.	19.	11.	30.	3.	12.	69.
6.	22.	10.	32.	3.	13.	70.
7.	2.	3.	5.	3.	10.	45.
8.	0.	0.	0.	0.	0.	0.
9.	19.	8.	27.	3.	21.	100.
10.	21.	10.	31.	3.	14.	67.
11.	20.	16.	36.	3.	12.	68.
12.	0.	0.	0.	0.	0.	0.
13.	3.	5.	8.	3.	15.	124.
14.	19.	8.	27.	3.	16.	70.
15.	2.	7.	9.	3.	15.	45.
17.	18.	14.	32.	3.	9.	32.
18.	9.	4.	13.	3.	15.	75.
19.	16.	12.	28.	3.	25.	79.
20.	30.	16.	46.	3.	19.	92.
21.	33.	16.	49.	3.	13.	92.
22.	9.	4.	13.	3.	15.	32.
23.	30.	18.	48.	3.	12.	91.
24.	61.	30.	91.	3.	19.	79.
25.	37.	22.	59.	3.	16.	100.
26.	0.	0.	0.	0.	0.	0.
27.	42.	22.	64.	3.	27.	92.
28.	0.	0.	0.	0.	0.	0.
29.	6.	5.	11.	3.	36.	101.
30.	8.	7.	15.	3.	20.	56.
31.	52.	20.	72.	3.	23.	92.
32.	0.	0.	0.	0.	0.	0.
33.	33.	15.	48.	3.	10.	65.
34.	30.	18.	48.	3.	12.	67.
35.	17.	11.	28.	3.	25.	70.

INPUT DATA FILE: CORRIDOR OPERATIONS, 3 YARD DIRECTIONAL ALT (COR3Y)

SEGMENT NUMBER	DAYTIME TRAINS	NIGHTTIME TRAINS	TRAINS PER DAY	LOCOMOTIVES PER TRAIN	SPEED MPH	CARS PER TRAIN
1.	30.	14.	44.	3.	31.	68.
2.	7.	2.	9.	3.	19.	67.
3.	28.	15.	43.	3.	30.	69.
4.	7.	4.	11.	3.	24.	60.
5.	9.	6.	15.	3.	20.	45.
6.	15.	9.	24.	3.	18.	67.
7.	8.	8.	16.	3.	13.	76.
8.	0.	0.	0.	0.	0.	0.
9.	18.	9.	27.	3.	26.	105.
10.	12.	4.	16.	3.	22.	46.
11.	16.	13.	29.	3.	14.	72.
12.	0.	0.	0.	0.	0.	0.
13.	4.	5.	9.	3.	24.	116.
14.	9.	4.	13.	3.	25.	49.
15.	14.	12.	26.	3.	15.	73.
17.	17.	16.	33.	3.	17.	80.
18.	9.	4.	13.	3.	20.	89.
19.	15.	14.	29.	3.	29.	89.
20.	32.	15.	47.	3.	27.	97.
21.	32.	17.	49.	3.	23.	96.
22.	9.	4.	13.	3.	16.	55.
23.	30.	19.	49.	3.	15.	92.
24.	56.	30.	86.	3.	17.	79.
25.	38.	20.	58.	3.	20.	94.
26.	0.	0.	0.	0.	0.	0.
27.	40.	20.	60.	3.	31.	90.
28.	0.	0.	0.	0.	0.	0.
29.	14.	7.	21.	3.	37.	98.
30.	1.	2.	3.	3.	22.	73.
31.	42.	20.	62.	3.	33.	92.
32.	0.	0.	0.	0.	0.	0.
33.	32.	20.	52.	3.	15.	65.
34.	33.	19.	52.	3.	15.	66.
35.	21.	13.	34.	3.	27.	84.

INPUT DATA FILE: CORRIDOR OPERATIONS, BIDIRECTIONAL 3 YARD ALT (CORBI)

SEGMENT NUMBER	DAYTIME TRAINS	NIGHTTIME TRAINS	TRAINS PER DAY	LOCOMOTIVES PER TRAIN	SPEED MPH	CARS PER TRAIN
1.	28.	17.	45.	3.	31.	70.
2.	7.	3.	10.	3.	19.	75.
3.	22.	15.	37.	3.	30.	76.
4.	8.	8.	16.	3.	24.	50.
5.	21.	8.	29.	3.	20.	64.
6.	22.	9.	31.	3.	18.	82.
7.	6.	7.	13.	3.	13.	54.
8.	0.	0.	0.	0.	0.	0.
9.	20.	11.	31.	3.	26.	77.
10.	24.	11.	35.	3.	22.	63.
11.	14.	9.	23.	3.	14.	85.
12.	0.	0.	0.	0.	0.	0.
13.	3.	5.	8.	3.	24.	30.
14.	20.	11.	31.	3.	25.	66.
15.	10.	10.	20.	3.	15.	85.
17.	17.	13.	30.	3.	17.	94.
18.	8.	1.	9.	3.	20.	27.
19.	22.	15.	37.	3.	29.	84.
20.	26.	19.	45.	3.	27.	85.
21.	25.	15.	40.	3.	23.	82.
22.	8.	1.	9.	3.	16.	27.
23.	21.	19.	40.	3.	15.	90.
24.	60.	30.	90.	3.	17.	83.
25.	43.	29.	72.	3.	20.	85.
26.	0.	0.	0.	0.	0.	0.
27.	54.	25.	79.	3.	31.	83.
28.	0.	0.	0.	0.	0.	0.
29.	5.	4.	9.	3.	37.	101.
30.	0.	0.	0.	0.	0.	0.
31.	51.	21.	72.	3.	33.	91.
32.	0.	0.	0.	0.	0.	0.
33.	20.	11.	31.	3.	15.	65.
34.	19.	11.	30.	3.	15.	66.
35.	5.	4.	9.	3.	27.	101.

APPENDIX B

Noise Measurement Instrumentation and Techniques

A B&K Type 4426 Noise Level Analyzer and Statistical Processor was the central part of the noise measurement instrumentation. The Noise Level Analyzer works as a digital precision sound level meter that measures the standard A-weighed noise level, dBA. It directly measures, calculates, and displays Leq.

A B&K Condensor Microphone Type 4165 was used together with the Noise Level Analyzer. This is a 1/2 inch diameter microphone with linear, 0° incidence, free-field frequency response. The microphone was detached from the Analyzer at the end of an extension cable. It is back-vented for use with a dehumidifier for measurements in humid environments. One complete set of noise instrumentation was used for all noise measurements taken during the survey. The complete set is listed below:

B&K 4426 Noise Level Analyzer, Serial No. 669306
B&K 2619 Pre-Amplifier
B&K 4230 Calibrator, Serial No. 724245
B&K 4165 Microphone, Serial No. 775253
B&K UA0308 Dehumidifier
B&K UA0049A Tripod
B&K A00028 10 Meter Extension Cable
B&K UA0237 Windscreen
B&K 2808 DC Power Supply

Monitoring sites were chosen which had level terrain, minimal ground cover, and free from large sound reflecting or absorbing objects such as trees, hills, and buildings. Community noise sites were located in as large of an open area as could be found within the residential neighborhoods.

The microphone was placed on a tripod 5 feet off the ground for all measurements, a position normally occupied by the ears of a standing listener. The microphone was orientated in a vertical direction in order to receive sounds from all sources. The microphone was approximately 10 meters from the sound analyzer during all sessions. Operating personnel stood behind the microphone at the maximum practical working distance in order to minimize shielding.

The instrumentation was calibrated utilizing a portable B&K 4230 Calibrator (with an accuracy of ±0.25 dB at 25°C) after set-up at each site, prior to the monitoring session. This resulted in the meter being calibrated several times a day. A microphone wind screen recommended by the manufacturer of the equipment was used during all measurements.

Pertinent atmospheric conditions such as wind speed and direction, cloud cover, temperature, humidity, and atmospheric pressure were recorded at each site. No measurements were conducted if the average wind speed was greater than 12 mph or gusting greater than 20 mph.

Each noise sample was a 33 1/3 minute continuous monitoring session, consisting of 2000 samples taken at one second intervals. The time constant used was the fast response time as defined in the American National Standard Institute S1.4-1971. Instantaneous samples were selected and measured at the one second intervals.

APPENDIX C

Verification of Line Operation Noise Model

Five sampling sites were selected to monitor St. Louis area railroad corridor operations in order to calibrate and verify the line noise model. The sampling locations were level and open areas that were free from sound reflecting or absorbing structures and vegetation. The rail tracks were both flat and straight. All sites were free from other significant noise sources.

Data were collected during the passage of each single train or "noise event". Leq values were measured at a distance ranging from 100 to 215 feet perpendicular to the centerline of the track. Only constantly moving trains were considered valid, if the train stopped the sample was discarded.

Table C1 lists the measured and predicted Leq values along with the information describing each train event. Train length and velocity were estimated from field data. The average length of each rail car and locomotive counted was assumed to be 65 feet. Train length in feet could then be calculated by multiplying the total number of cars and locomotives in each train by 65. Speed was determined by dividing the train length by the duration of each train pass-by (the length of time for the complete train to move past the microphone).

The predicted Leq noise levels were calculated for a single train pass-by from the model described in Appendix D (EPA 1975). The model is based on the maximum noise levels and exposure time duration of both the engine and car noise components. Single event noise exposure levels (SENEL) for locomotives and cars were modeled separately and then combined for a total SENEL for each train pass-by. Predicted Leq values were then calculated from the total SENEL and the length of integration time in seconds of the corresponding measured Leq samples.

The rail line traffic during measurement was a mixture of coal, freight, and tank cars. Train length ranged from 3 to 103 cars. Locomotive power consisted of both road and switch engines.

It was observed that trains powered by switch engines had lower Leq values than road engine powered trains. Available data indicate that switch engines emit smaller maximum noise levels than road engines.

The model uses a maximum noise level of 85 dBA (of a single stationary locomotive operating at throttle 8 at 100 feet) instead of the 90 dBA value recommended by EPA, 1975. This lower level is more representative of the locomotive power mix used in the project area and provides the best fit for the measured data.

TABLE C1

Comparison of Measured and Predicted Leq Values for a Single Train Pass-by

Measured Leq (dBA)	Predicted[1] Leq (dBA)	Velocity (MPH)	Number of Cars	Number and Type of Locomotives	Measurement Distance (ft)
69	76	23	19	2 switchers	100
71	75	10	32	1 switch & 1 road	100
79	74	24	64	2 road	100
80	78	27	21	1 road	100
80	78	26	42	2 road	100
78	77	25	65	2 road	100
81	81	39	91	3 road	100
74	78	32	102	2 road	100
79	82	40	89	3 road	100
78	76	24	97	2 road	100
75	79	11	4	1 switcher	100
78	73	31	103	6 road	200
70	69	21	91	2 road	200
76	75	15	42	3 switchers	128
78	75	9	70	2 switchers	91
76	79	35	91	2 road	100
73	72	18	3	1 Amtrack	215

(1) Reference: EPA, December 1975. Background Document for Railroad Noise Emission Standards. EPA - 550/9-76-005.

APPENDIX D

RAILROAD NOISE MODEL

Noise sources and activities can be characterized in terms of their operational parameters, such as usage time or rate of occurrence, distribution during the day time and night time periods, and location. A noise generation model was developed for each identified source for which a noise data base existed. The preliminary assumption was that the noise levels beyond the railyard boundary were due to widely separated individual sources and groups of sources of the same type.

Examination of the yard noise source characteristics indicated that only two types of basic noise generation models were necessary, one for stationary sources and another for moving sources. In the case of stationary or groups of like stationary sources, the corresponding average daily noise levels are a function of source strength and percentage of time operating or number of on-off events. For the moving sources, the average daily noise levels at any observation location are a function of source strength and number of pass-by events. The noise levels estimated for the groups of distributed sources of the same type were used to determine property line noise levels and the impact analysis (EPA 1979).

The L_{eq} noise level can then be predicted at any distance (D) from the noise source as a function of the activity level or number of events. The general equation for a 24-hour L_{eq} is:

$$L_{eq} = SENEL_{100} + 10 \log N - 49.4 - 10 \log (D/100)^{n} - a.g. - \Delta s$$

where: $SENEL_{100}$ = Single Event Noise Level for each source at 100 feet

N = Number of events emitting noise

n = One for a moving source

n = Two for a point source

a.g. = Combined air and ground absorption

Δs = Shielding attenuation

49.4 = Constant for 24-hour value

RAILROAD LINES

Line traffic includes all corridor or mainline operations and the inbound/outbound train traffic within yards. The noise level from a single train pass-by is a combination of the

locomotive and the freight car components. Since the maximum noise levels and duration of the engine and car elements of train noise are independent of each other, SENEL values for locomotives and cars will be modeled separately and then combined for a total SENEL of an average train pass-by. The attenuation of train noise is approximated with reasonable accuracy by using a straight line falling off at a rate of 6 dBA per doubling of distance (EPA 1975). Average rail car length was assumed to be 65 feet.

The model used was based on information in the Background Document for Railroad Noise Emission Standards, EPA-550/9-76-005, December 1975.

The average train length, number of locomotives, and velocity were determined from the traffic mix for a "typical" train on each corridor segment and alternative. The 24-hour L_{eq} values were then calculated from the number of trains per day.

The SENEL of a group of locomotives passing by is:

$$SENEL_L = L_L + 10 \log (\pi D_o/2V) + 10 \log n \qquad \text{[EPA 1975]}$$

where: L_L = Noise level measured by a stationary observer at distance Do from a single locomotive
L_L = 85 dBA (Appendix C)

n = Number of locomotives within the group

D_o = perpendicular distance to track = 100 feet

V = Locomotive speed in feet per second

The SENEL of the car component at 100 feet is:

$$SENEL_C = 72 + 30 \log V/20 + 10 \log t \qquad \text{[EPA 1975]}$$

where: V = Train speed in miles per hour

t = Pass-by time in seconds = (number of cars x length of each car [65 feet])/velocity

The SENEL for the total train is by logarithmic addition:

$$SENEL_T = 10 \log [10^{(SENEL_L/10)} + 10^{(SENEL_C/10)}]$$

To compute the equivalent noise level L_{eq} for a 24-hour day at any distance D:

$$L_{eq} = SENEL_T + 10 \log N - 49.4 - 20 \log (D/100) - \Delta s \qquad \text{[EPA 1975]}$$

where: N = Number of train events each day

Δs = Shielding attenuation

RAIL YARDS

Individual operations throughout the yard occur in centralized areas or "noise centers," based on prior knowledge of the individual yard's design and activity. Noise projections are based on the SENEL values for each source, all at a standard reference of 100 feet. Leq values at any desired distance may then be calculated as a function of the activity level or number of occurrences of noise producing events.

The model used was based on information presented in the Background Document for Final Interstate Rail Carrier Noise Emission Regulation: Source Standards, EPA, December 1979.

MASTER AND GROUP RETARDERS

The master, group and tangent retarders were modeled as a grouped point source located at the geometric center of the retarders. The number of noise events or squeals is the product of the number of cars humped per day, the number of retarders each car must pass, and the percentage of cars which squeal. During humping operations at the St. Louis area Gateway yard, it was observed that retarder squeal occurred approximately 33 percent of the time.

$$L_{eq} = SENEL + 10 \log N - 49.4 - 20 \log (D/100) - a.g. - \Delta s$$

where: SENEL = 108 dBA. This value is based on a maximum noise level of 111 dBA and a pulse time of 0.5 seconds (EPA 1979)

N = Number of noise producing events = cars humped per day x fraction which squeal x number of retarders each must pass through

INERT RETARDERS

Inert retarders were also modeled as a grouped point source located at the geometric center of the retarders. It was assumed that each car leaving the yard passes an inert retarder and that approximately 85 percent produce a noise event.

$$L_{eq} = SENEL + 10 \log N - 49.4 - 20 \log (D/100) - a.g. - \Delta s$$

where: SENEL = 90 dBA. Based on an energy average maximum noise level of 93 dB and a pulse duration of 0.5 seconds (EPA 1979)

N = Number of events = percent which squeal x average number of cars through inert retarders

HUMP SWITCH ENGINE

Hump engine operations were modeled as a line source operating at a speed of approximately 4 MPH. It is assumed that the engine will make two pass-bys for every cut pushed over the hump, one to push the cut and another to return to position. The noise center is along the length of track typically traveled; either along the hump leads and hump runners or the centerline of the receiving yard track.

$$L_{eq} = SENEL + 10 \log N - 49.4 - 10 \log (D/100) - a.g. - \Delta s$$

where: SENEL = 95 dBA at 100 feet (EPA 1979)

N = Number of cuts over hump x 2

PULL ENGINE SWITCHING

The noise center of the pull switcher engine is along the length of track typically traveled or the centerline of the departure tracks. Pull engine activity was modeled as a line source moving at a speed of less than 5 MPH. At this low speed, the car noise component is negligible. It is assumed that a pull engine will make two pass-bys for each block removed from the classification tracks.

$$L_{eq} = SENEL + 10 \log N - 49.4 - 10 \log (D/100) - a.g. - \Delta s$$

where: SENEL = 98 dBA (EPA 1979)

N = 2 x number of blocks pulled

LOCOMOTIVE ENGINE LOAD TESTS

Locomotive load tests were modeled as stationary point sources.

$$L_{eq} = L_{eq(1)} + 10 \log N - 13.8 - 20 \log (D/100) - a.g. - \Delta s$$

where: $L_{eq(1)}$ = 90 dBA = hourly L_{eq} value during operation of load test (EPA 1979)

N = Number of hours operating

COUPLING IMPACTS

Car coupling impacts are randomly distributed in the classification tracks. The coupling impacts within a hump yard were divided into two independent noise source groups, and were modeled as two groups of stationary point sources. It was assumed that the total number of car impacts is equal to the number of cars humped per day, distributed evenly between the two noise centers. Smaller flat yards were modeled as one point source.

$$L_{eq} = SENEL + 10 \log N - 49.4 - 20 \log (D/100) - a.g. - \Delta s$$

where: SENEL = 94 dBA where the maximum noise level is 99 dBA (EPA 1979)

N = Number of impacts = cars humped per day/2 for a hump yard distributed over two noise sources

CONCENTRATED FLAT YARD SWITCHER ACTIVITY

Makeup, industrial and other flat yard switch engine operations were modeled as moving point sources distributed in the centerline of the tracks. The number of noise events were equal to the number pass-bys per day of the switchers. In the noise model it was assumed that L_{max} = 83 dBA at 100 feet was representative or typical for all switchers except for the hump lead. The car noise component is minimal at the low speeds encountered.

$$L_{eq} = SENEL + 10 \log N - 49.4 - 10 \log (D/100) - a.g. - \Delta s$$

where: SENEL = 98 (EPA 1979)

N = Total number of pass-bys

IDLING LOCOMOTIVES AND REFRIGERATION CARS

Both idling locomotives and refrigeration cars were modeled as grouped point sources. However, the L_{eq} values were developed from a truncated line source model which transformed the line of point sources into a grouped point source. This was considered appropriate since the sources may be grouped in a square or rectangular pattern (EPA 1979).

$$L_{eq} = L_{eqH} + 10 \log(N/24) + 8 \log(1.33 \times NC) + 10 \log(NR) - 20 \log (D/100) - a.g.$$

where: L_{eqH} = Average hourly L_{eq} for a single car or locomotive at 100 feet (EPA 1979)
Switcher (<2,500 HP): $L_{eqH} = 65$
Road Engine (>2,500 HP): $L_{eqH} = 67$
Refrigerator car: $L_{eqH} = 67$

N = Number of hours of operation each day

NC = Number of locomotives or cars per row

NR = Number of rows

COMPUTATION OF EQUIVALENT SOUND LEVEL L_{eq}

The Leq for a continuous noise source having a constant value of L_{max} is:

$$L_{eq} = L_{max}$$

An intermittent noise source L_{max} operates for a fraction (χ) of the total time (T). For values of L_{max} that are 10 dB or more higher than the background noise level (Lb), L_{eq} is approximated quite accurately by:

$$L_{eq} = L_{max} + 10 \log \chi$$ [EPA 1974]

The fraction (χ) of the total time period (T) is a function of the pulse duration (t) of the individual noise event, the number of such events (N), and the total time period (T).

$$\chi = Nt/T$$

$$L_{eq} = L_{max} + 10 \log (Nt/T)$$

$$L_{eq} = L_{max} + 10 \log t + 10 \log N - 10 \log T$$

For a 24-hour Leq, where t and T are in seconds:

$$L_{eq(24)} = L_{max} + 10 \log t + 10 \log N - 10 \log (60 \text{ sec/min} \times 60 \text{ min/hr} \times 24 \text{ hr/day})$$

$$L_{eq(24)} = L_{max} + 10 \log t + 10 \log N - 49.4$$

The single event noise exposure level (SENEL) describes a particular type of single event in terms of both its maximum noise level (L_{max}) and its duration (t). It can be closely approximated by:

$$SENEL = L_{max} + 10 \log t$$

L_{eq} then becomes a function of SENEL and the number of events.

$$L_{eq(24\text{-}hr)} = \text{SENEL} + 10 \log N - 49.4$$

For a steady state noise, where the $L_{eq(1\text{-}hr)}$ remains constant during the hours it is operated (N):

$$L_{eq} = L_{eq(1\text{-}hr)} + 10 \log \chi$$

χ = fraction of day = Number of hours operating/24 hours

$$L_{eq(24)} = L_{eq(1\text{-}hr)} + 10 \log (N/24)$$

$$L_{eq(24)} = L_{eq(1\text{-}hr)} + 10 \log N - 10 \log (24)$$

$$L_{eq} = L_{eq(1\text{-}hr)} + 10 \log N - 13.8$$ [EPA 1979]

NOISE ATTENUATION

Total noise attenuation or the reduction in sound level with distance is a function of the type of source, air absorption, distance, ground attenuation, and the shielding effects of barriers, buildings and vegetation. Railroads emit a wide variety of noise sources, many of which have considerably different spectral characteristics and air and ground absorption factors than traffic noise sources (EPA 1979).

Divergence Loss or Geometric Spreading

The sound from a source spreads out uniformly and decreases as it travels away from the source. The noise level at any distance is related to the noise level at a known distance. This known or reference distance is usually 100 feet, a distance widely used in railroad noise studies. For a point source, the sound level drops off at the rate of 6 dBA for each doubling of distance. For a line or moving source, the drop off rate is 3 dBA for each doubling of distance. Mathematically, the sound level (L) at any distance (D) is:

Point Source: $L_D = L_{100} - 20 \log (D/100)$

Moving Source: $L_D = L_{100} - 10 \log (D/100)$

Air and Ground Absorption (a.g.)

In addition to the divergence or spreading loss, the noise energy is dissapated in the air medium and absorbed along the ground. The amount of air and ground absorption due to molecular absorption is dependent on the frequency of the

sound and on humidity and temperature. The greatest noise level attenuation will occur for the high frequency components (e.g., retarders).

Atmospheric effects would seldom increase but could significantly decrease sound levels at large distances from a source (Bolt, Beranek and Newman 1973).

The resulting combined air and ground absorption factors representing the attenuation of the A-weighted noise levels with distance are shown for each noise source type in Table D1.

Shielding Adjustment (Δs)

Shielding occurs when the observer's view of the souce is obstructed or partially obstructed by an object which significantly interferes with the propogation of the sound waves. Shielding can be provided by dense woods, rows of buildings, and/or barriers (FHWA 1978).

Heavy, dense growths of woods provide a small but useful amount of attenuation. A dense woods 100 feet deep would provide 5 dBA attenuation (FHWA 1978).

The expected total insertion loss for several rows of buildings was in the range of 5 dBA for low density residential area (single-floor dwellings), and 8 dBA for higher-density areas of multi-floor buildings (EPA 1979).

TABLE D1

COMBINED AIR AND GROUND ATTENUATION FACTOR (a.g.)
FOR MAJOR RAIL YARD NOISE SOURCES (EPA 1979)

Noise Source	Combined Air and Ground Attenuation Factor (dB/ft)
Retarders	0.01
Switch Engines	0.001
Car Impacts	0.005
Idling Locomotives	0.0025
Locomotive Load Tests	0.002
Refrigeration Cars	0.0035
Road-Haul Locomotives	0.002

NOTE: Mathematically, a.g. = (Dis-100) x Attenuation Factor at any distance (Dis), based on a reference distance of 100 feet.

Appendix II

Table of Contents

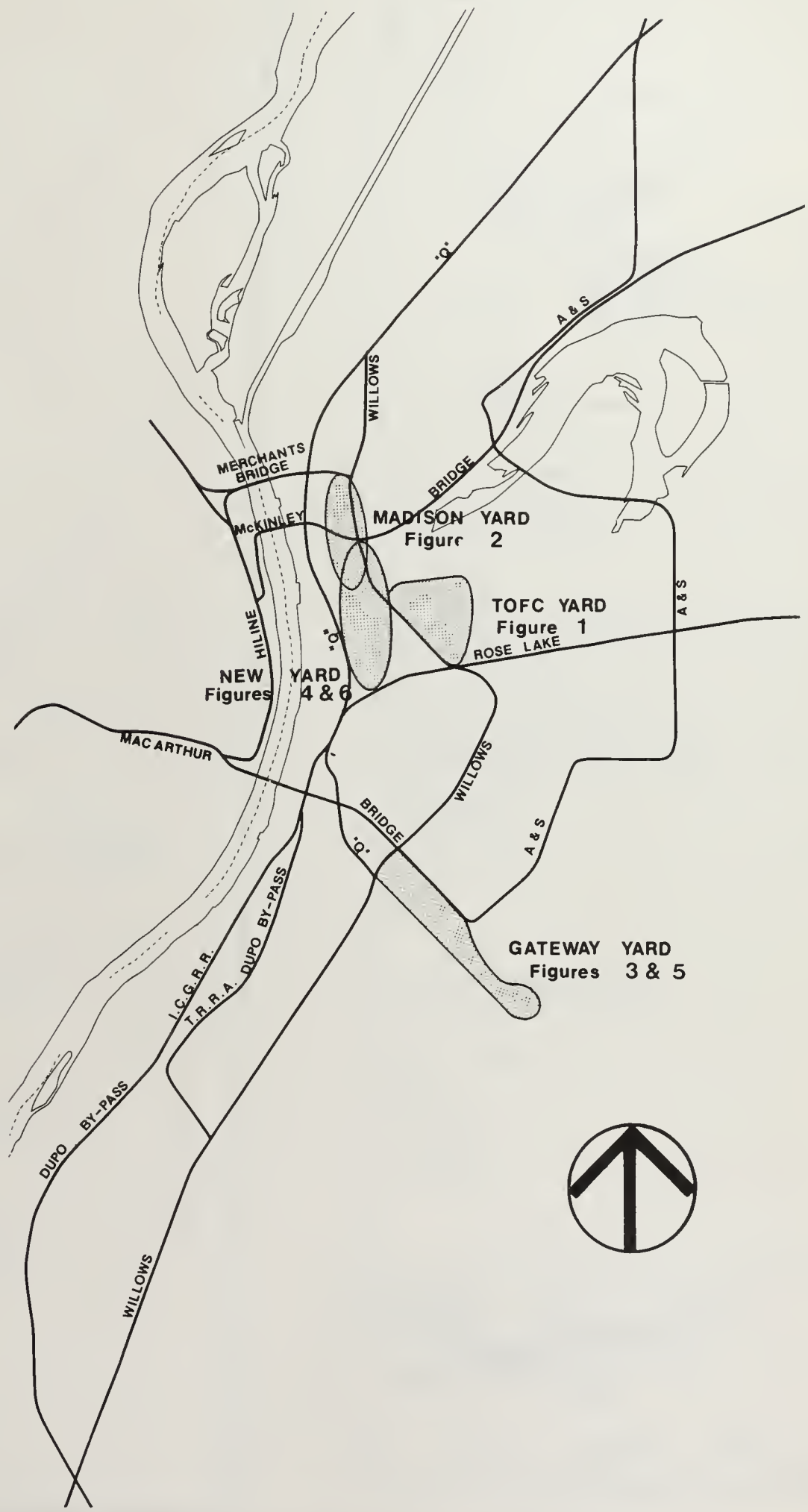
TABLE OF CONTENTS

Rail Yards (Madison, Gateway, New, & TOFC)	Section I
Q Corridor	Section II
A&S Corridor	Section III
Willows Corridor	Section IV
Dupo Bypass Corridor (TRRA)	Section V
Dupo Bypass Corridor (ICGRR)	Section VI
Rose Lake Corridor	Section VII
Hiline Corridor	Section VIII
MacArthur Bridge Corridor	Section IX
Merchants Bridge Corridor	Section X
McKinley Bridge Corridor	Section XI

Section I

MAJOR RAIL YARDS

KEY MAP



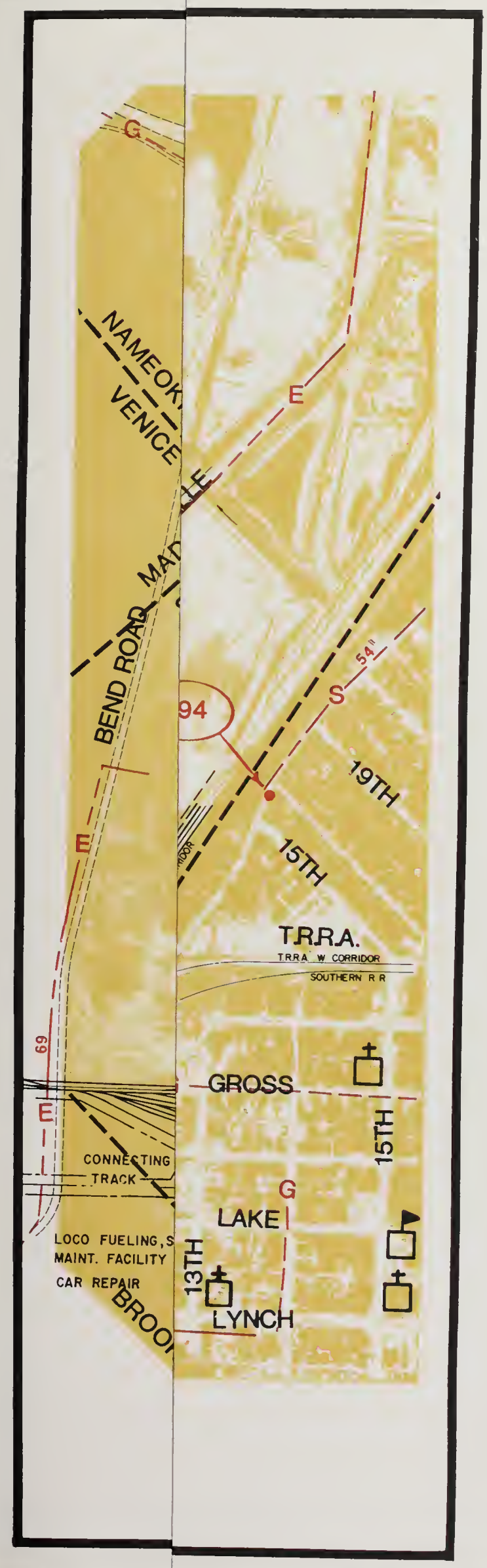
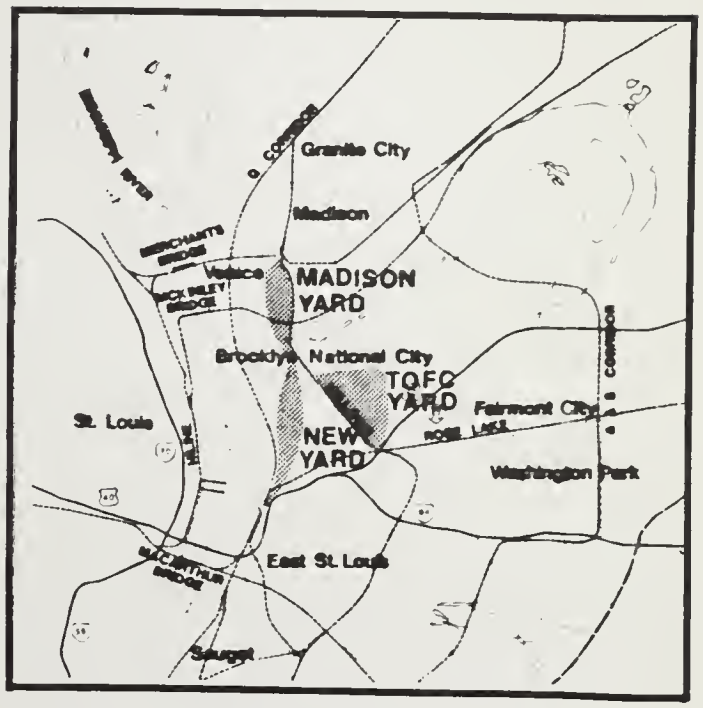


FIGURE 1

TOFC / COFC YARD

TWO YARD ALTERNATIVE
THREE YARD ALTERNATIVES



VICINITY MAP

LEGEND

RAILROAD TRACK
CITY LIMITS
R.O.W. ACQUISITION
PROPOSED CULVERT
SCHOOL
CHURCH

NOISE RECEPTOR

ELECTRIC — E —
GAS — G —
WATER — W —
SEWER — S —

800 400 0 800

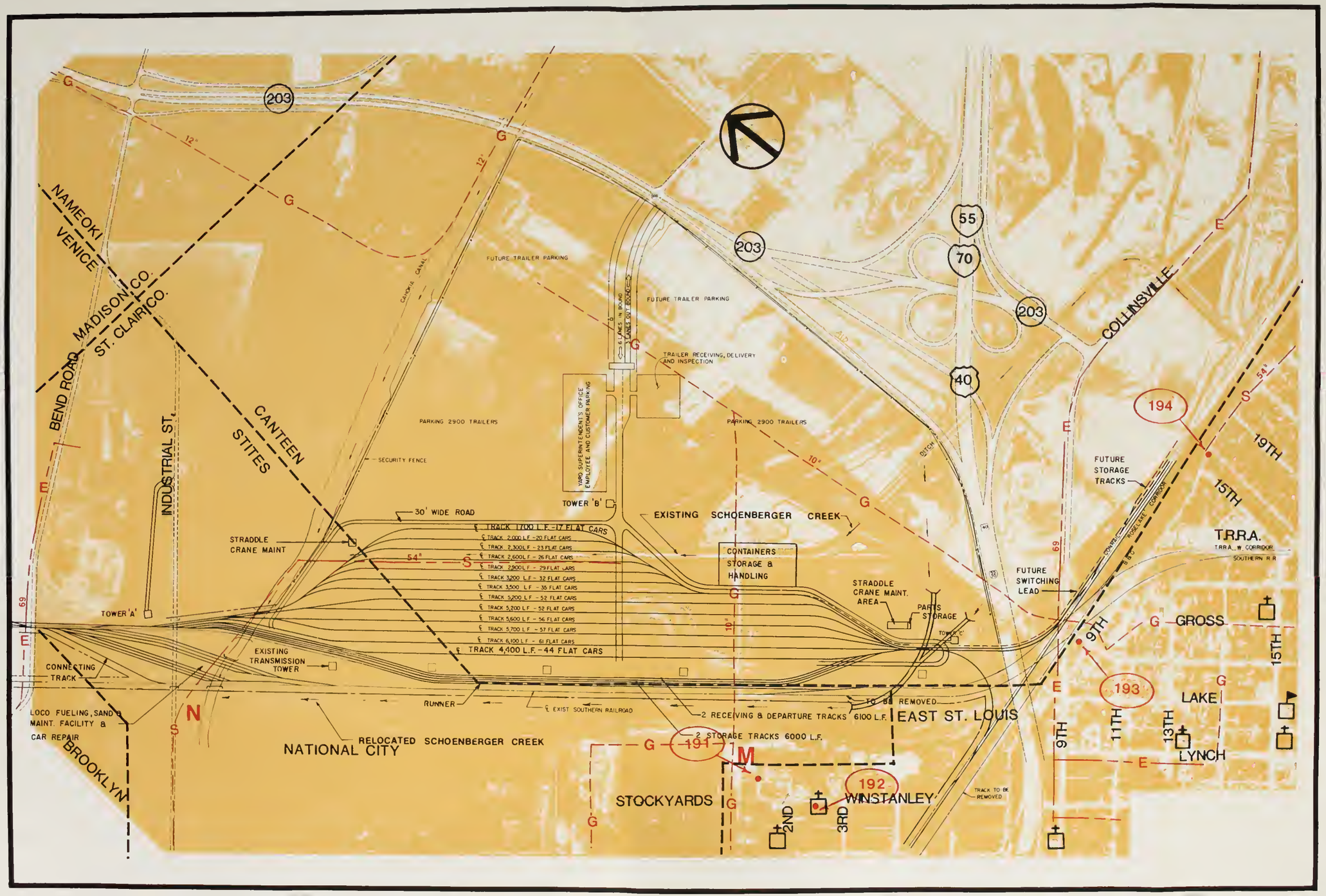
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 1

TOFC / COFC YARD

TWO YARD ALTERNATIVE
THREE YARD ALTERNATIVES



VICINITY MAP

LEGEND

- RAILROAD TRACK
- CITY LIMITS
- R.O.W. ACQUISITION
- PROPOSED CULVERT
- SCHOOL
- CHURCH
- NOISE RECEPTOR
- ELECTRIC — E —
- GAS — G —
- WATER — W —
- SEWER — S —

800 400 0 800

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 2

EXPANDED MADISON YARD

TWO YARD ALTERNATIVE

VICINITY MAP

LEGEND

RAILROAD TRACK	
PROPOSED PUBLIC RD	
CITY LIMITS	
EXISTING R.O.W.	
R.O.W. ACQUISITION	
SCHOOL	
CHURCH	
MITIGATION ZONE	
OPEN BUFFER	
NOISE RECEPTOR	
ELECTRIC	E
GAS	G
WATER	W
SEWER	S

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 2

EXPANDED MADISON YARD

TWO YARD ALTERNATIVE

VICINITY MAP

LEGEND

- RAILROAD TRACK
- PROPOSED PUBLIC RD
- CITY LIMITS
- EXISTING R.O.W.
- R.O.W. ACQUISITION
- SCHOOL
- CHURCH
- MITIGATION ZONE
- OPEN BUFFER
- NOISE RECEPTOR
- ELECTRIC — E —
- GAS — G —
- WATER — W —
- SEWER — S —

400 200 0 400

SCALE IN FEET

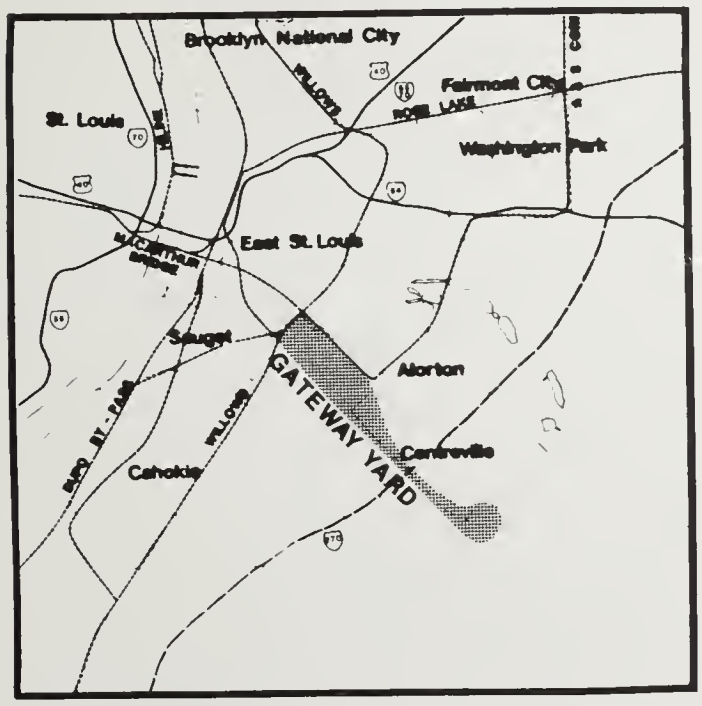
ST. LOUIS MARGE PROJECT
SVERDRUP / ENVIRODYNE / KNIGHT

FIGURE 3

EXPANDED GATEWAY YARD

TWO YARD ALTERNATIVE

THREE YARD DIRECTIONAL ALTERNATIVE



VICINITY MAP

LEGEND

RAILROAD TRACK	
PROPOSED PUBLIC RD	
CITY LIMITS	
EXISTING R.O.W.	
R.O.W. ACQUISITION	
SCHOOL	
CHURCH	
MITIGATION ZONE	
OPEN BUFFER	
NOISE RECEPTOR	
ELECTRIC	E
GAS	G
WATER	W
SEWER	S

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

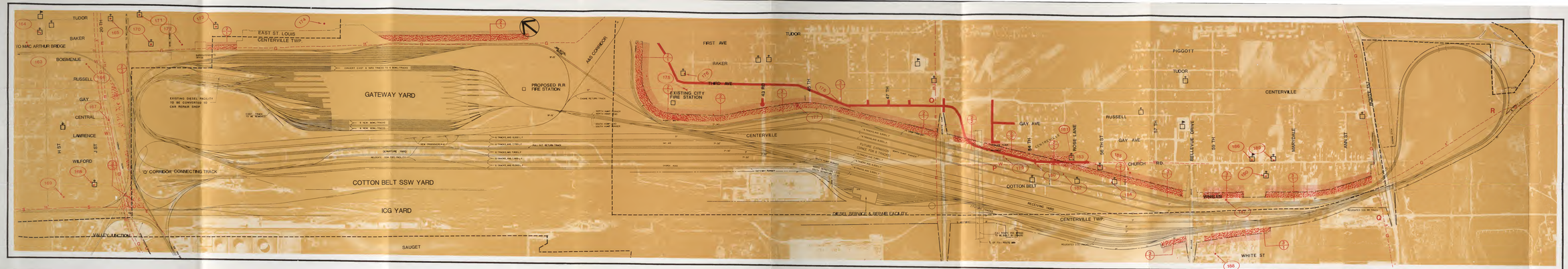


FIGURE 3
EXPANDED GATEWAY YARD
TWO YARD ALTERNATIVE
THREE YARD DIRECTIONAL ALTERNATIVE

VICINITY MAP

LEGEND

- RAILROAD TRACK
- PROPOSED PUBLIC RD
- CITY LIMITS
- EXISTING R.O.W.
- R.O.W. ACQUISITION
- SCHOOL
- CHURCH
- MITIGATION ZONE
- OPEN BUFFER
- NOISE RECEPTOR
- ELECTRIC — E —
- GAS — G —
- WATER — W —
- SEWER — S —

400 200 0 400
SCALE IN FEET

ST. LOUIS MARGE PROJECT

FIGURE 4

NEW YARD

THREE YARD DIRECTIONAL ALTERNATIVE

VICINITY MAP

LEGEND

RAILROAD TRACK	
PROPOSED PUBLIC RD	
CITY LIMITS	
EXISTING R.O.W.	
R.O.W. ACQUISITION	
SCHOOL	
CHURCH	
MITIGATION ZONE	
OPEN BUFFER	
NOISE RECEPTOR	
ELECTRIC	E
GAS	G
WATER	W
SEWER	S

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

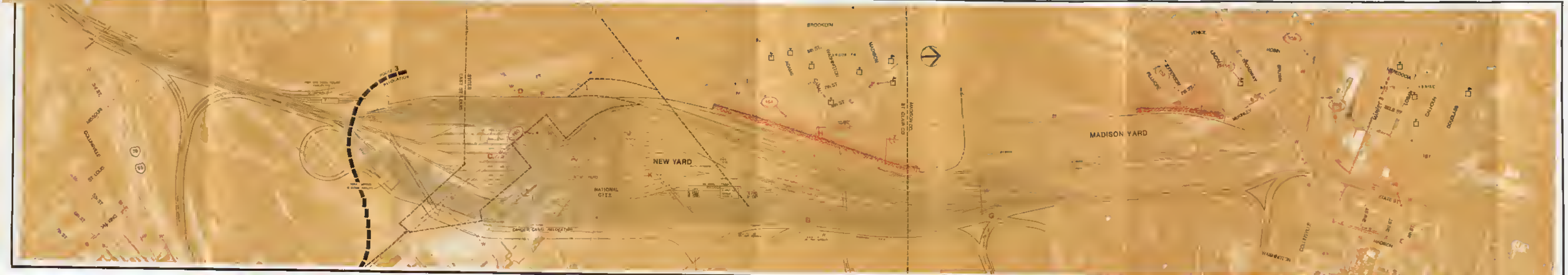


FIGURE 4

NEW YARD

VICINITY MAP

LEGEND

RAILROAD TRACK
PROPOSED PUBLIC RD
CITY LIMITS
EXISTING R.O.W.
R.O.W. ACQUISITION
SCHOOL
CHURCH
ELECTRIC
GAS
WATER
SEWER

400 200 0 400

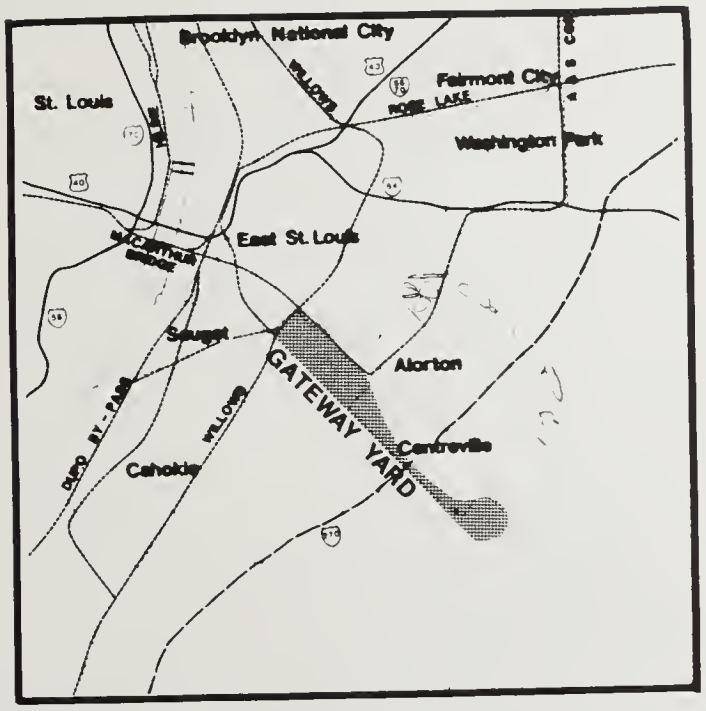
SCALE IN FEET

ST LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 5

EXPANDED GATEWAY YARD

THREE YARD BIDIRECTIONAL ALTERNATIVE



VICINITY MAP

LEGEND

RAILROAD TRACK
PROPOSED PUBLIC RD
CITY LIMITS
EXISTING R.O.W.
R.O.W. ACQUISITION
SCHOOL
CHURCH
MITIGATION ZONE
OPEN BUFFER
NOISE RECEPTOR
ELECTRIC — E —
GAS — G —
WATER — W —
SEWER — S —

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

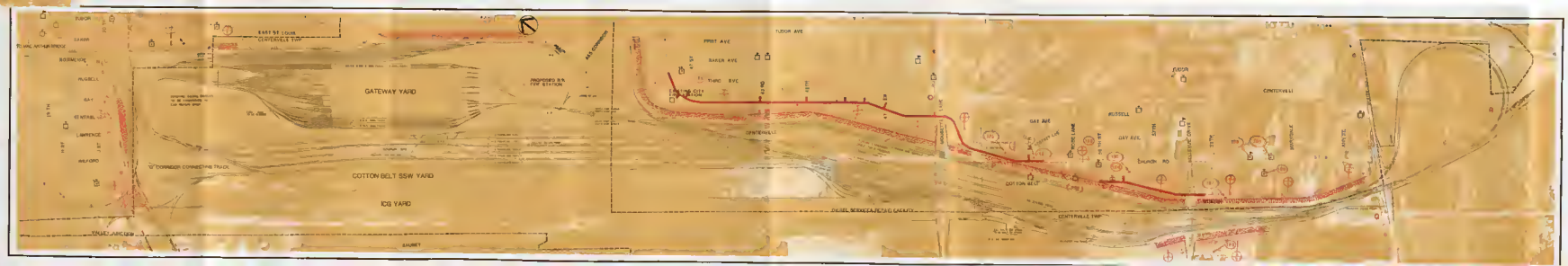


FIGURE 5

EXPANDED GATEWAY YARD

VICINITY MAP

LEGEND

RAILROAD TRACK
PROPOSED PUBLIC RD
CITY LIMITS
EXISTING R.O.W.
R.O.W. ACQUISITION
SCHOOL
CHURCH
MITIGATION ZONE
OPEN BUFFER
NOISE RECEIVER
EXISTING
GAS
WATER
SEWER

400 200 0 400

SCALE IN FEET

FIGURE 6

NEW YARD

THREE YARD BIDIRECTIONAL ALTERNATIVE

VICINITY MAP

LEGEND

RAILROAD TRACK	
PROPOSED PUBLIC RD	
CITY LIMITS	
EXISTING R.O.W.	
R.O.W. ACQUISITION	
SCHOOL	
CHURCH	
MITIGATION ZONE	
OPEN BUFFER	
NOISE RECEPTOR	
ELECTRIC	E
GAS	G
WATER	W
SEWER	S

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP / ENVIRODYNE / KNIGHT

FIGURE 6

NEW YARD

THREE YARD BIDIRECTIONAL ALTERNATIVE

VICINITY MAP

LEGEND

RAILROAD TRACK
PROPOSED PUBLIC RD
CITY LIMITS
EXISTING R.O.W.
R.O.W. ACQUISITION
SCHOOL
MITIGATION ZONE
NOISE RECEPTOR
ELECTRIC
GAS
WATER
SEWER

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section II

Section II

Q CORRIDOR

KEY MAP

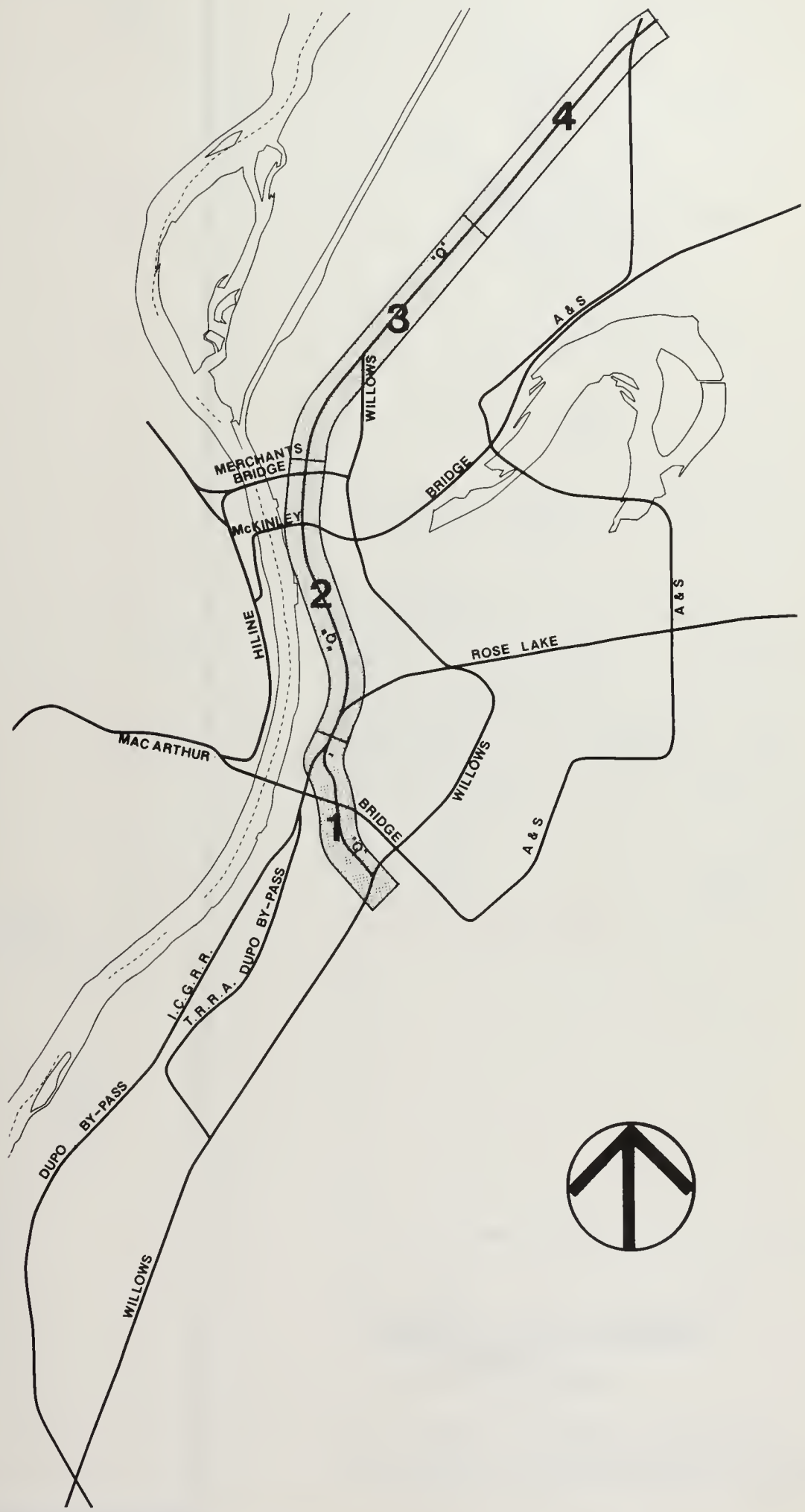
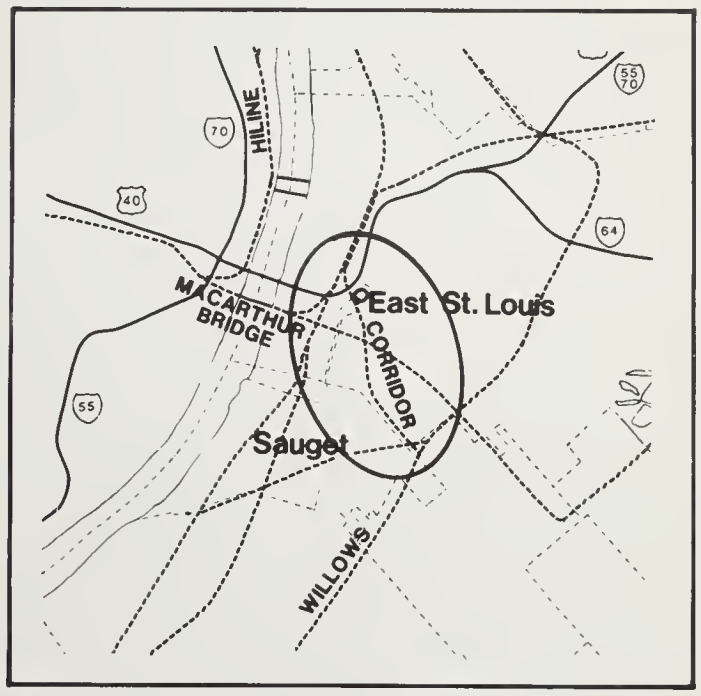


FIGURE 1 OF 4

Q CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

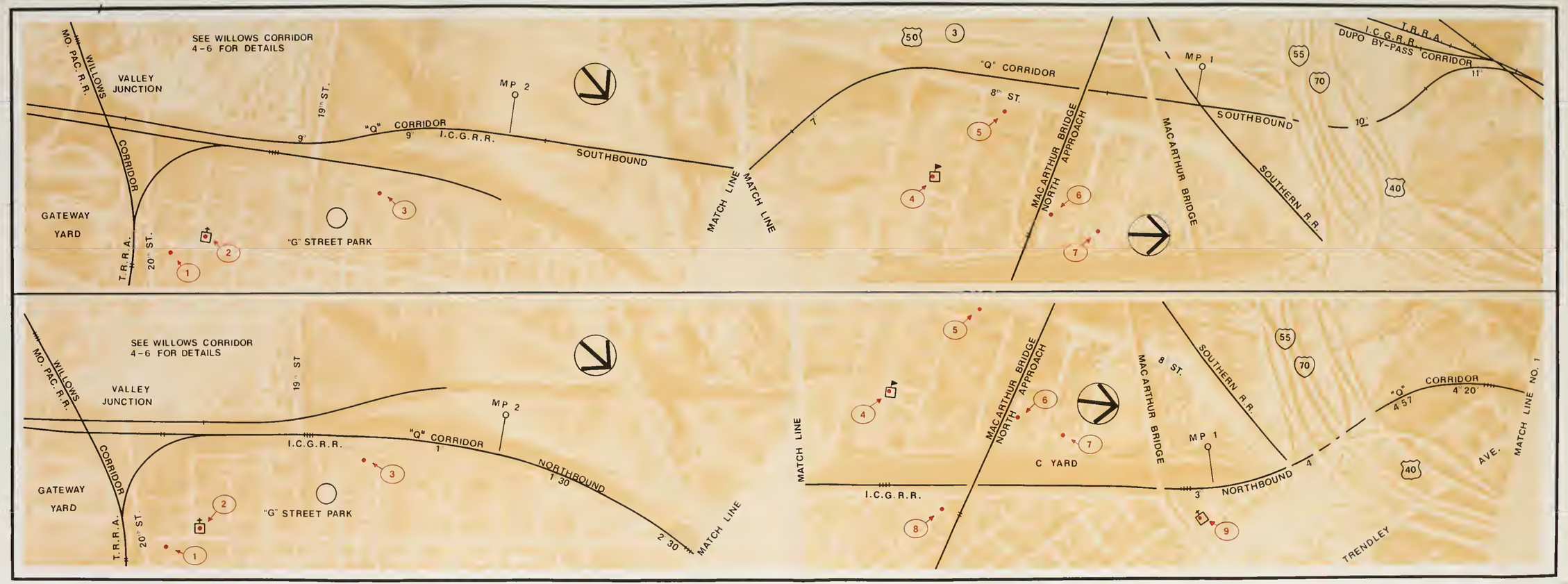
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 1 OF 4

Q CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT

SVERDRUP/ENVIRODYNE/KNIGHT

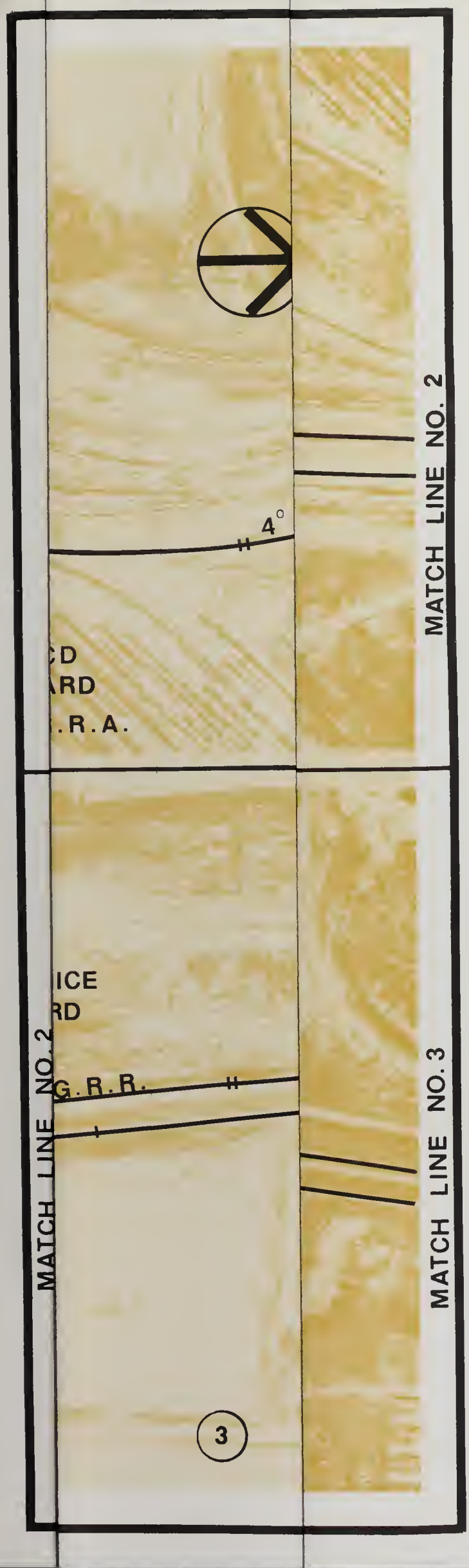
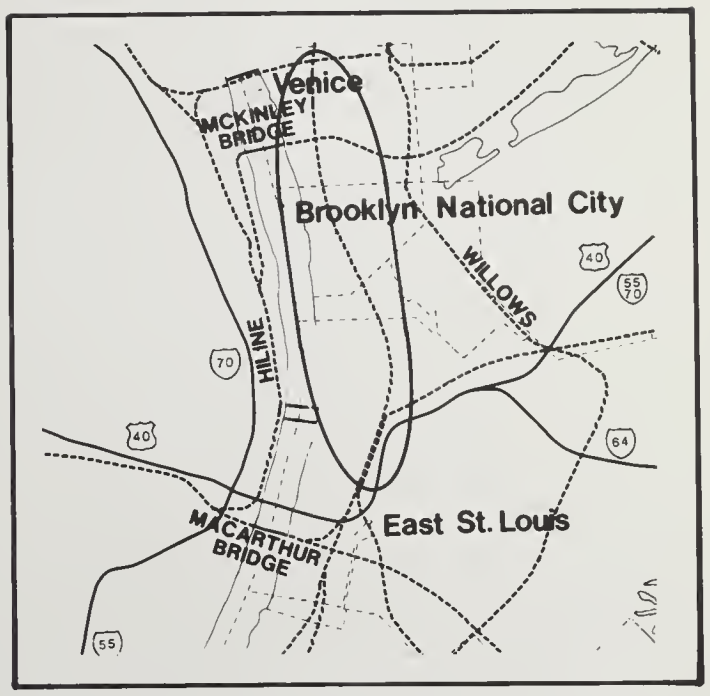


FIGURE 2 OF 4

Q CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL

PROPOSED RAIL

NUMBER OF TRACKS
(Designated by Vertical Lines)

MILEPOST

SCHOOL

CHURCH

NOISE RECEPTOR

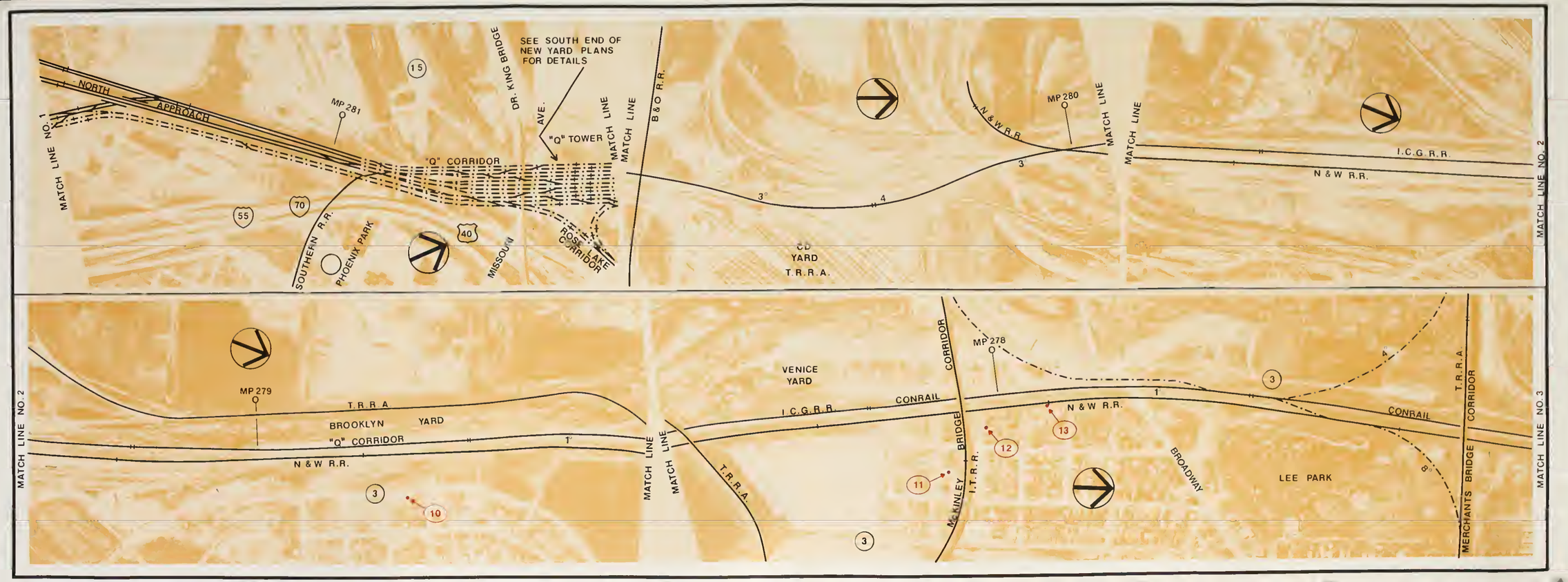
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 2 OF 4

Q CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

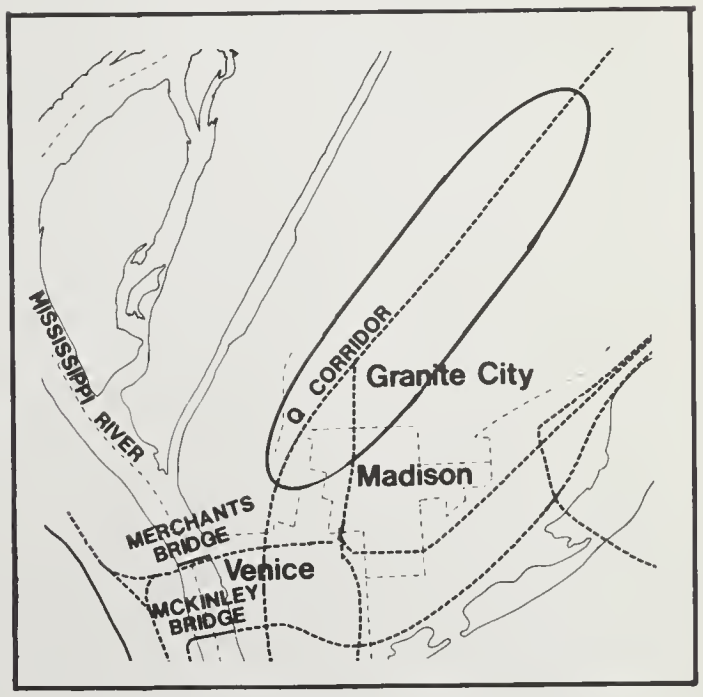
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 3 OF 4

Q CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

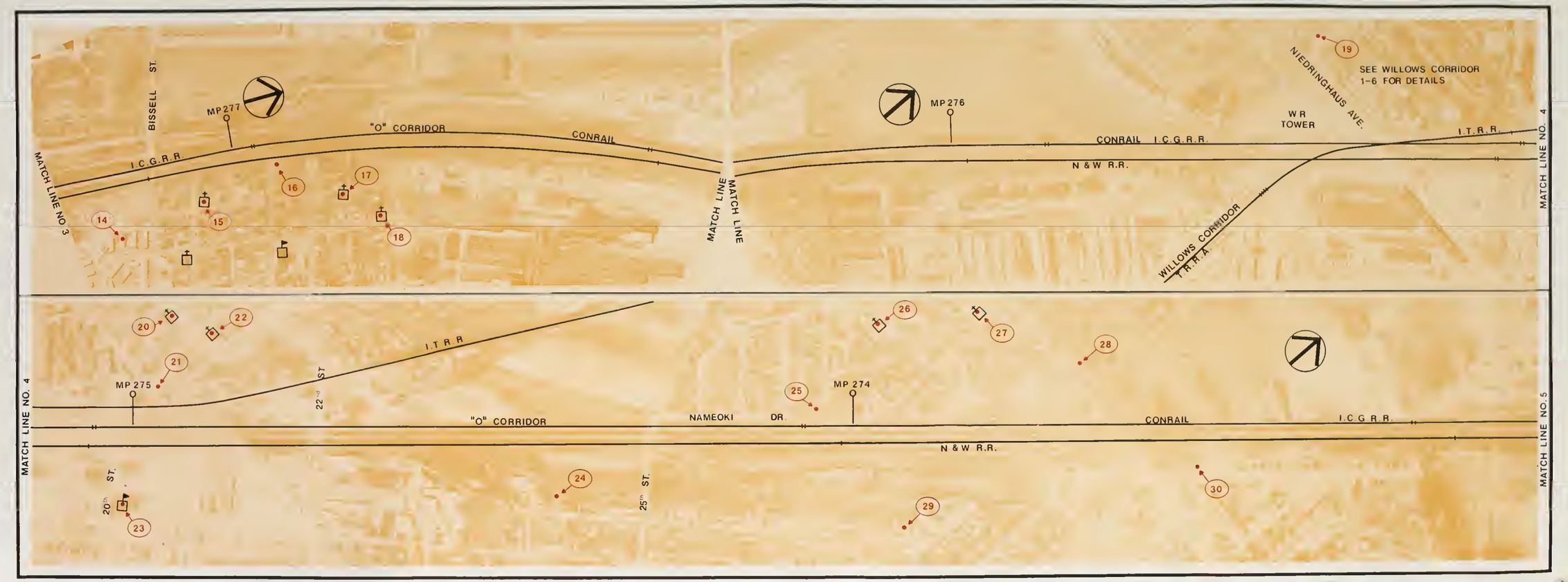
400 200 0 400

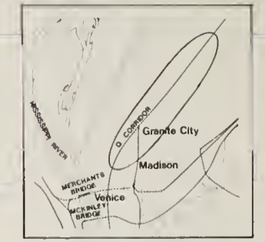
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 3 OF 4

Q CORRIDOR





VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

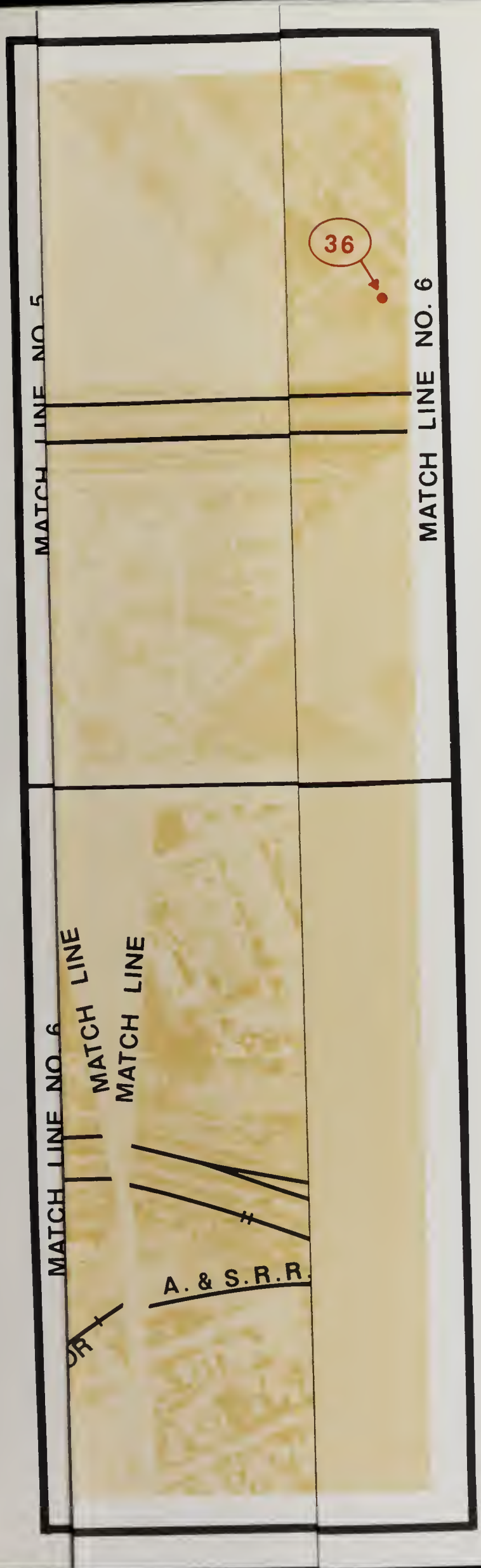
400 200 0 400

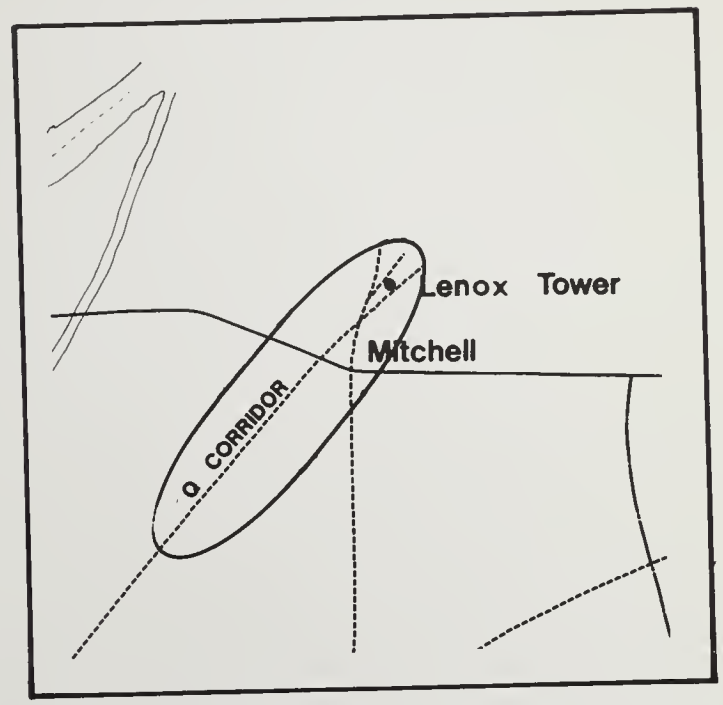
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 4 OF 4

Q CORRIDOR





VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

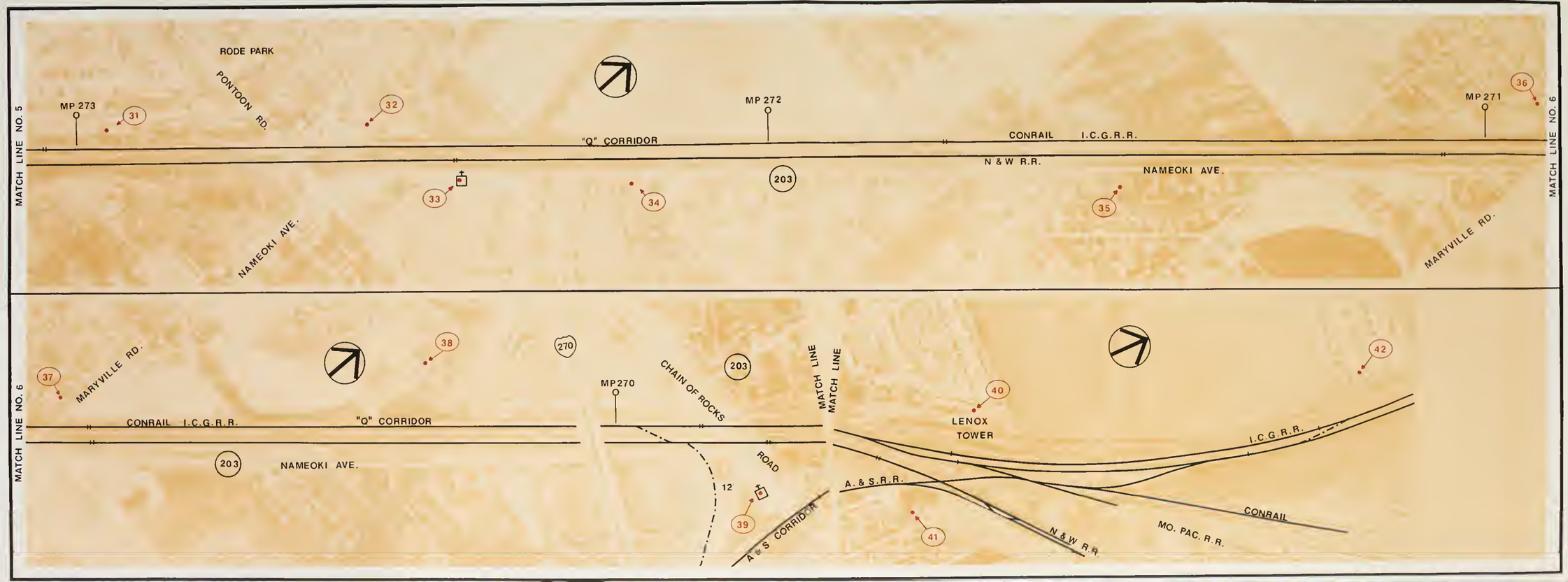
400 200 0 400

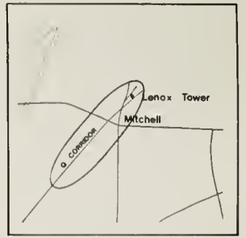
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 4 OF 4

Q CORRIDOR





VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section III

Section III

A & S CORRIDOR

KEY MAP

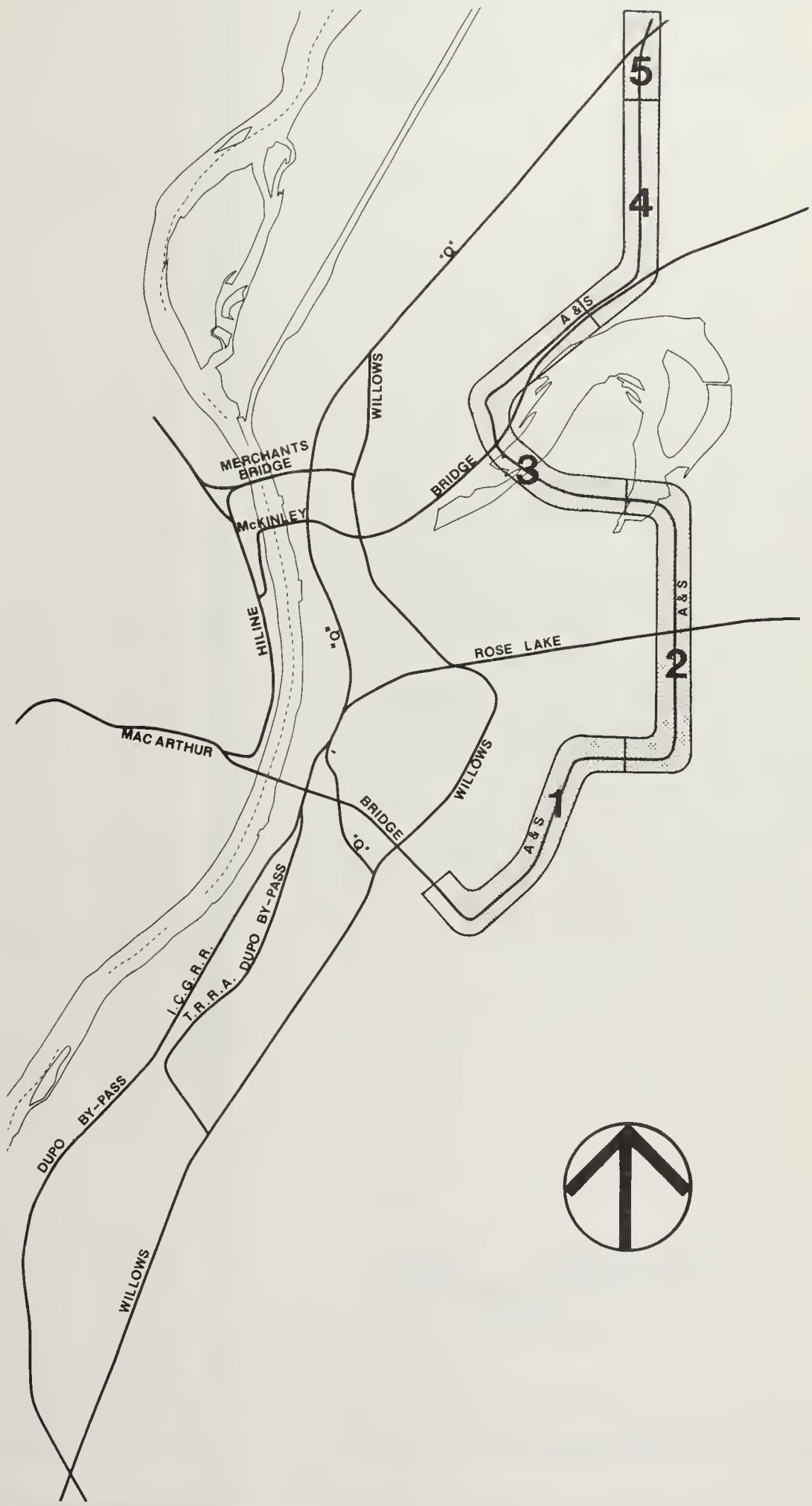
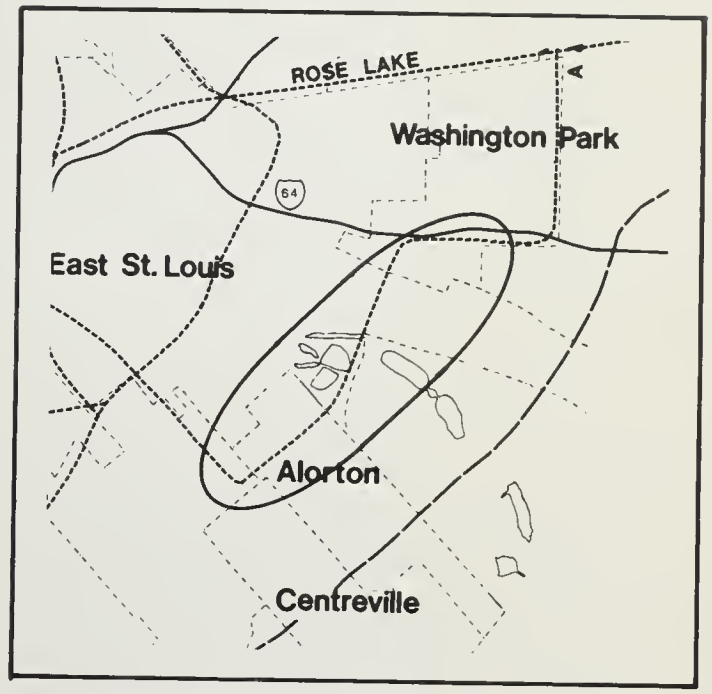


FIGURE 1 OF 5

A & S CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL

PROPOSED RAIL

NUMBER OF TRACKS
(Designated by Vertical Lines)

MILEPOST

SCHOOL

CHURCH

NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

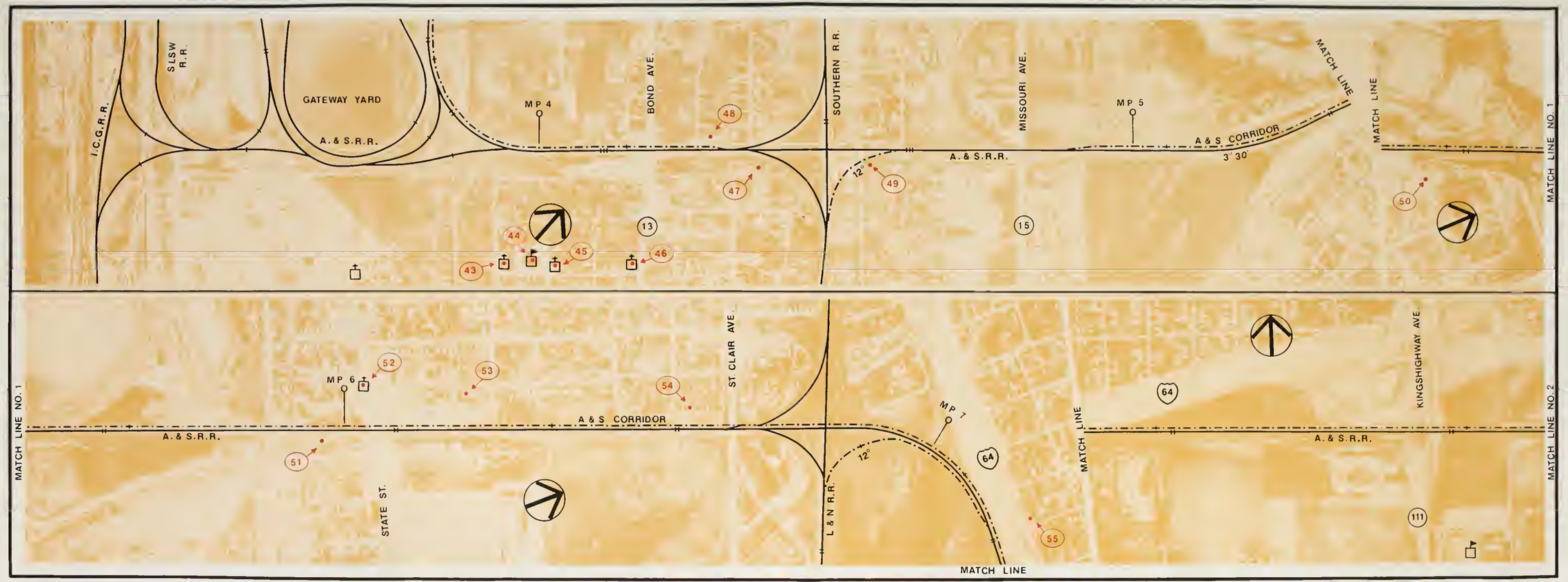


FIGURE 1 OF 5

A & S CORRIDOR

VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

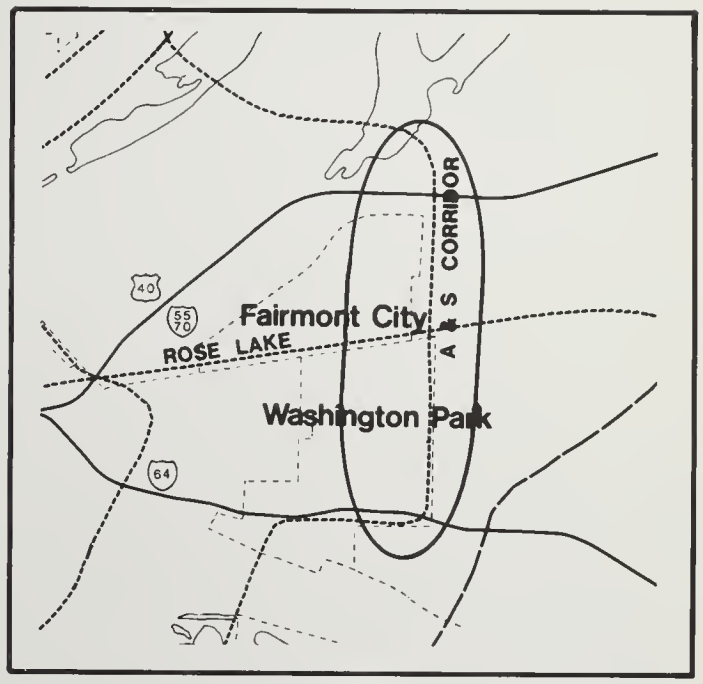
SCALE IN FEET

ST. LOUIS MARGE PROJECT

SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 2 OF 5

A & S CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL

PROPOSED RAIL

NUMBER OF TRACKS
(Designated by Vertical Lines)

MILEPOST

SCHOOL

CHURCH

NOISE RECEPTOR

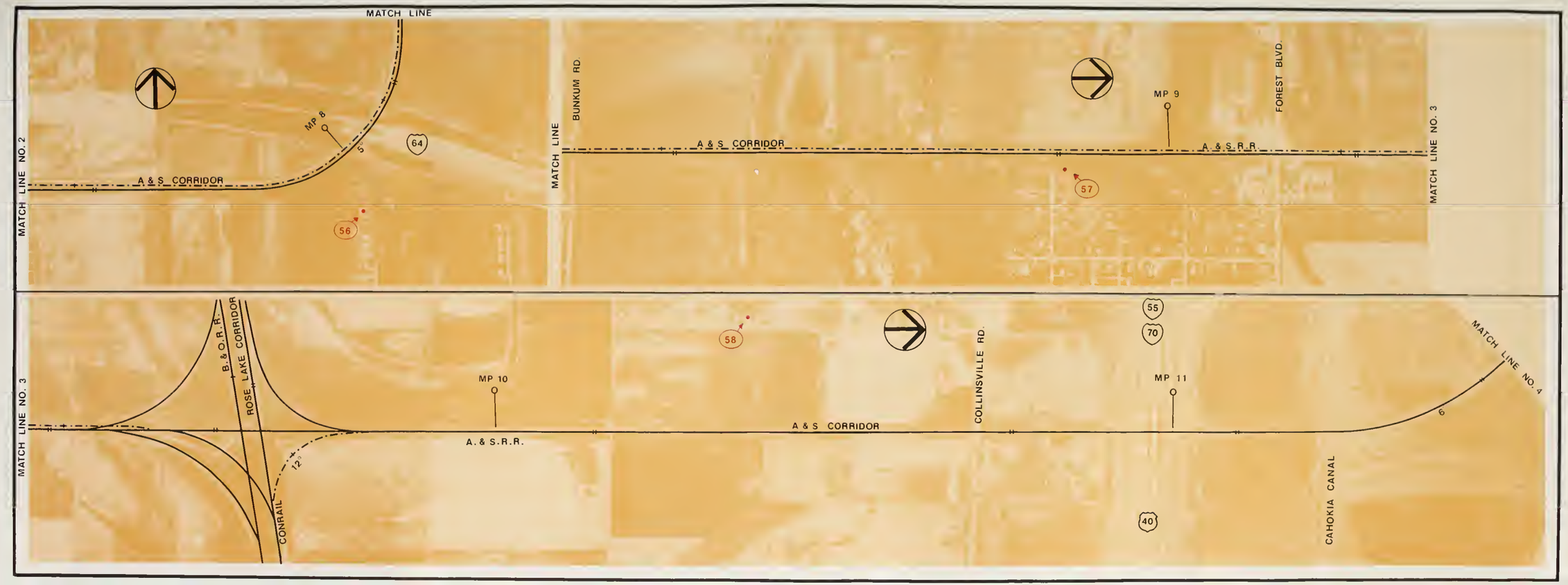
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 2 OF 5

A & S CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

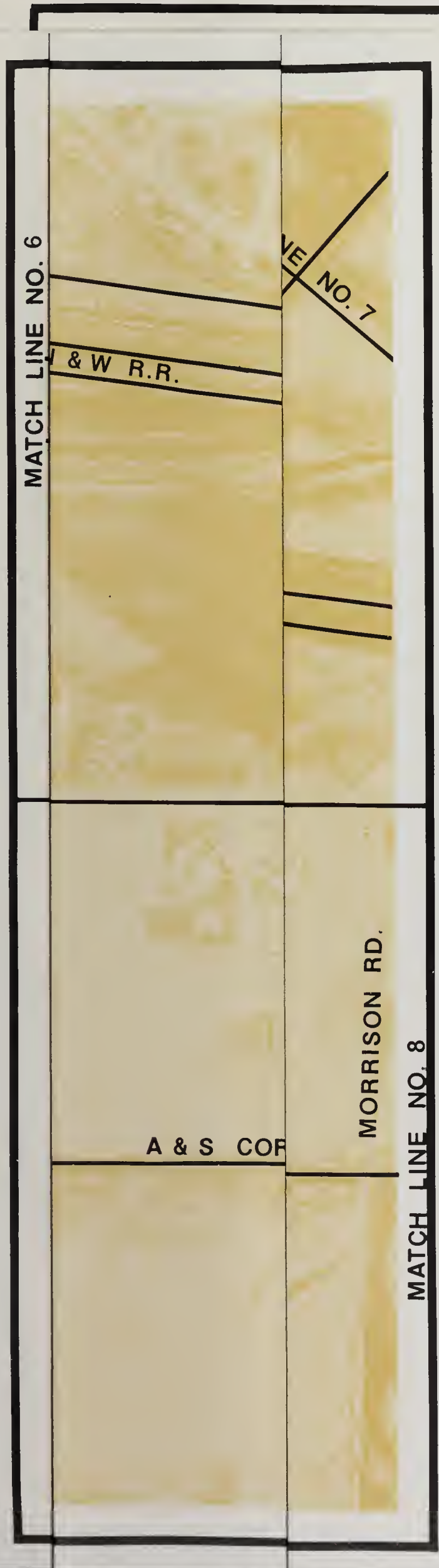
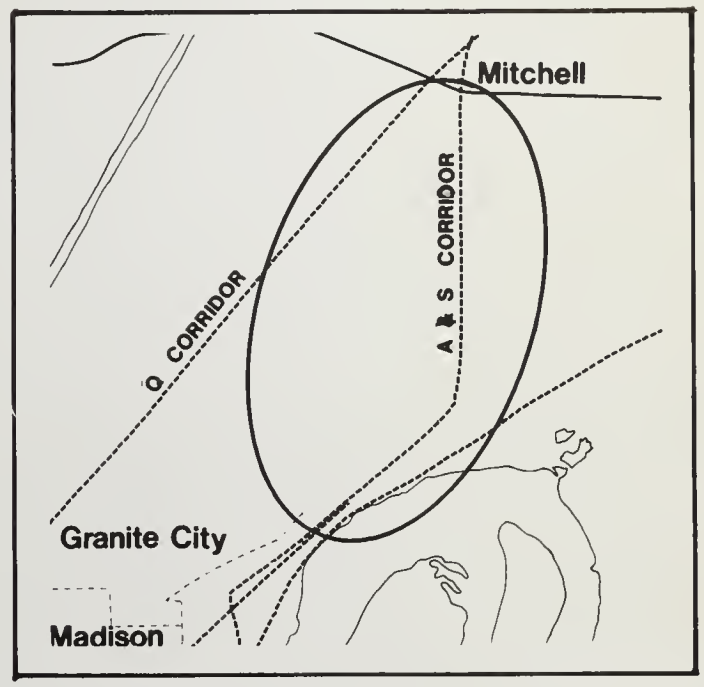


FIGURE 4 OF 5

A & S CORRIDOR



VICINITY MAP
LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

400 200 0 400
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

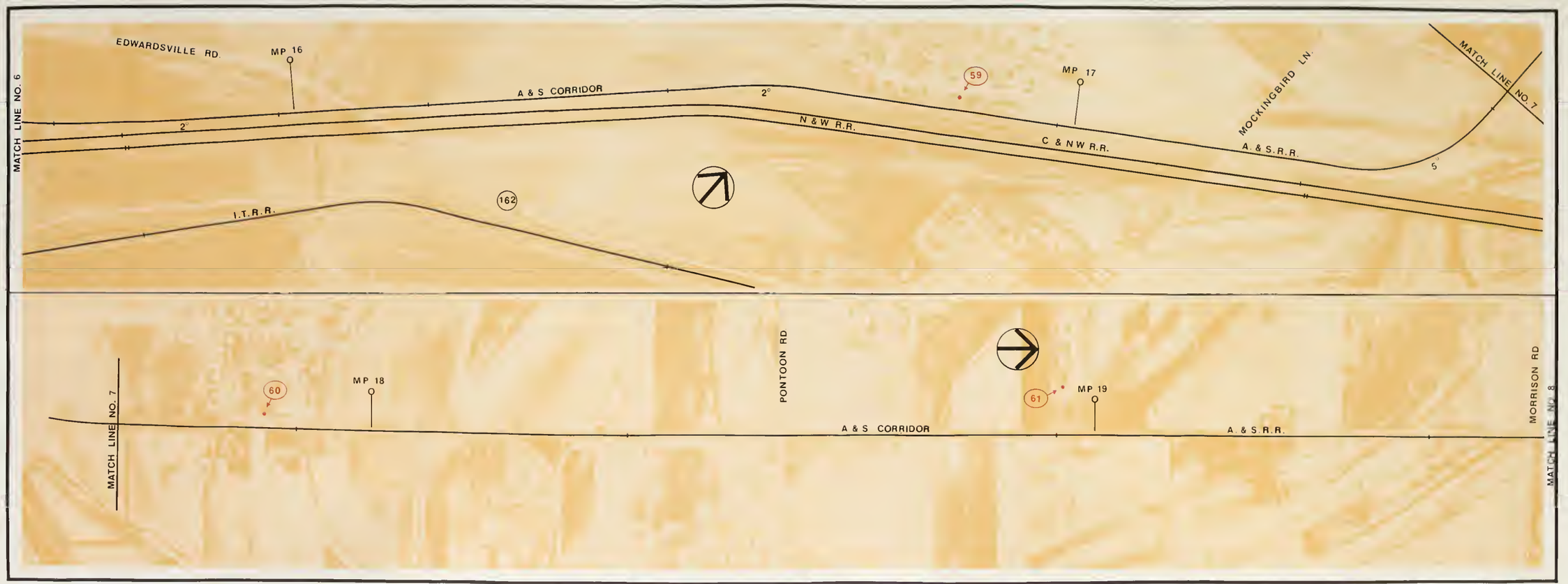
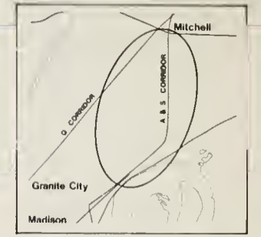


FIGURE 4 OF 5

A & S CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT

SVERDRUP/ENVIRODYNE/KNIGHT

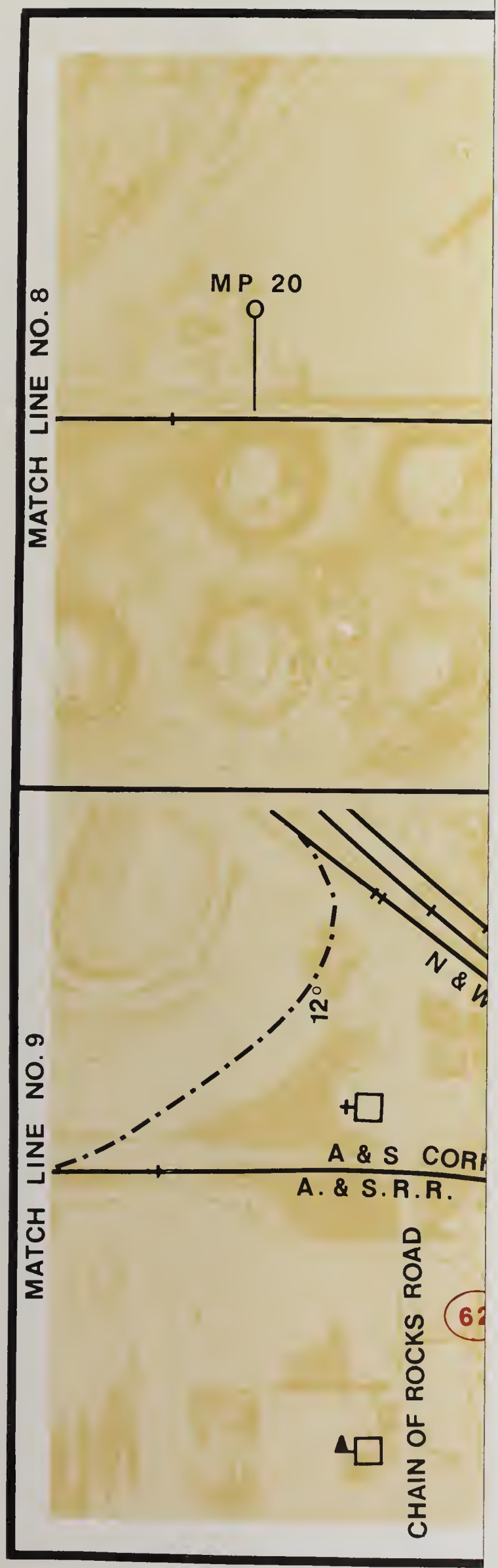
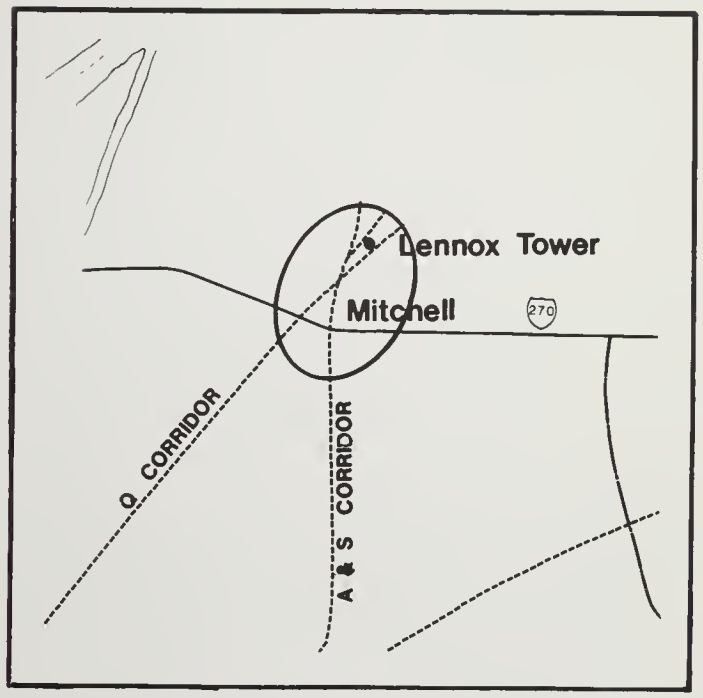


FIGURE 5 OF 5

A & S CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

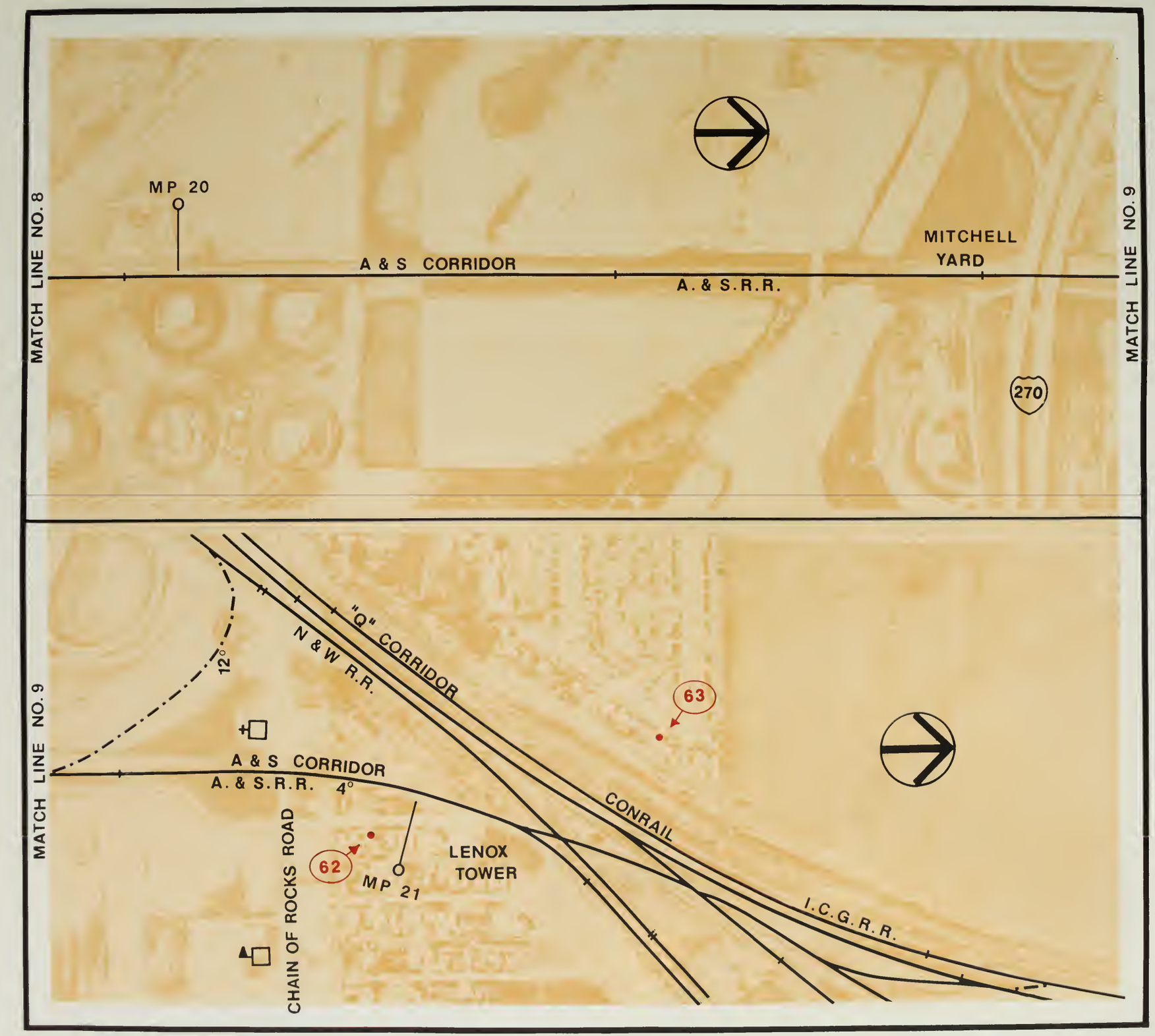
400 200 0 400

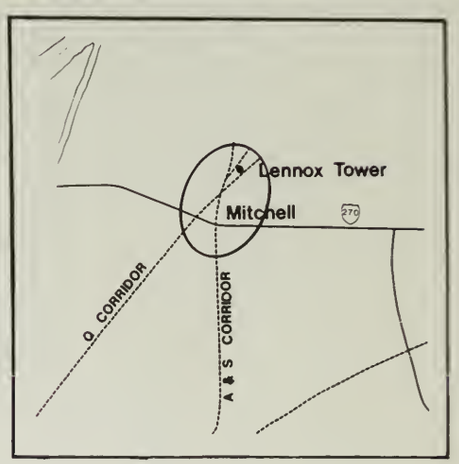
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 5 OF 5

A & S CORRIDOR





VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

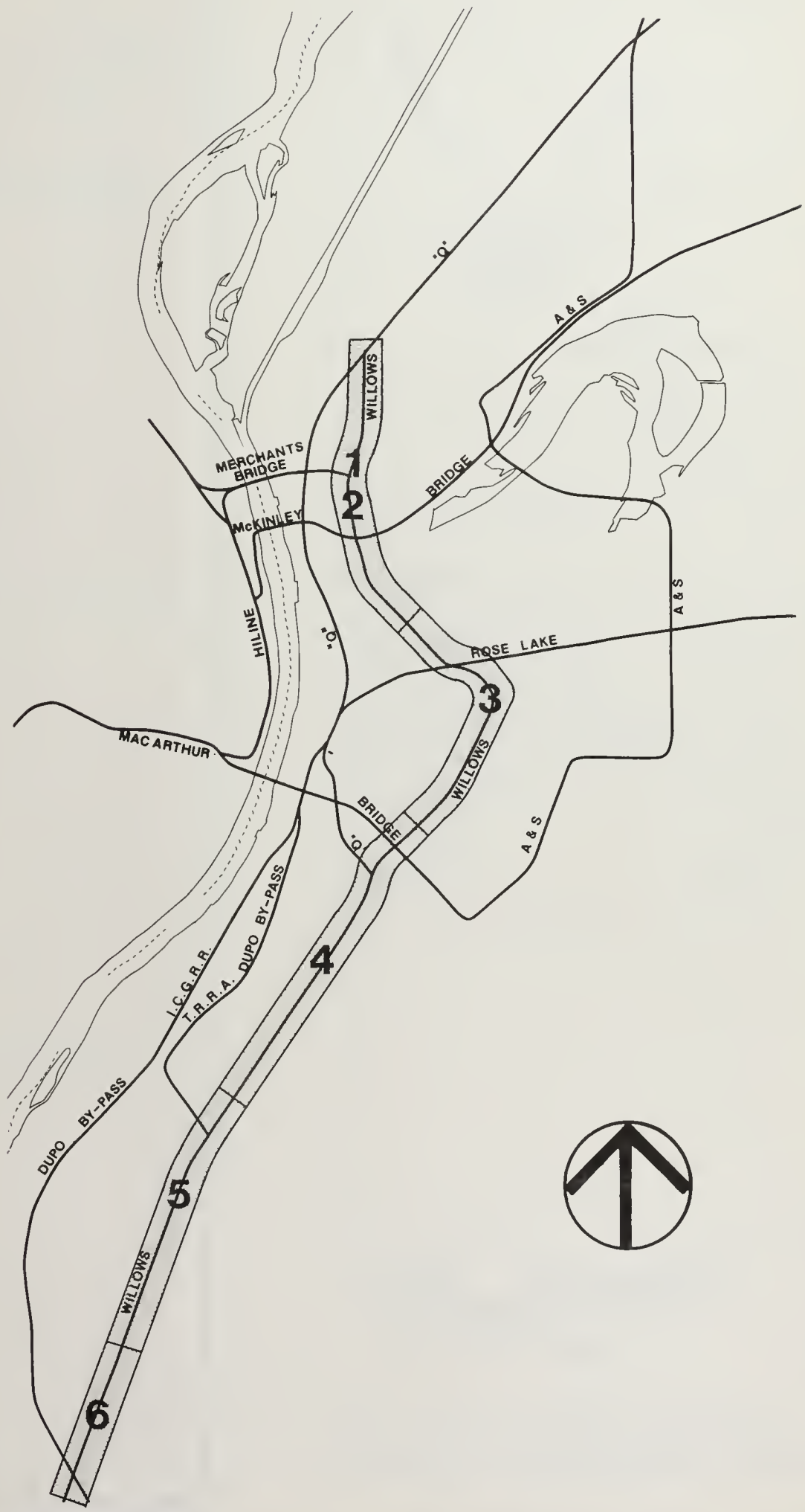
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section IV

WILLOWS CORRIDOR

KEY MAP



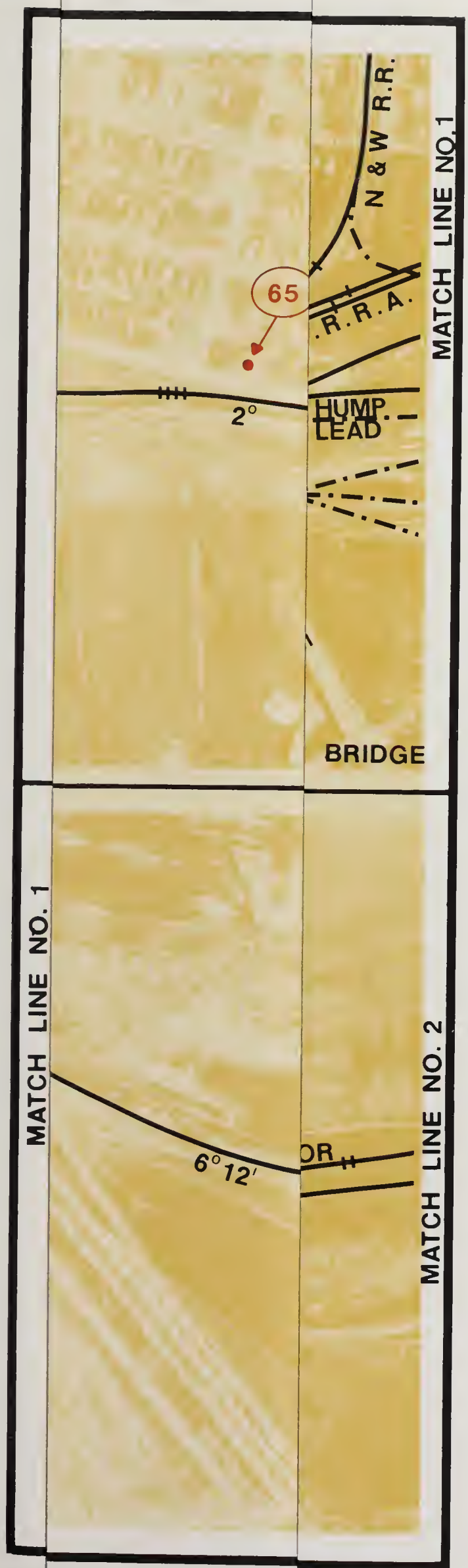
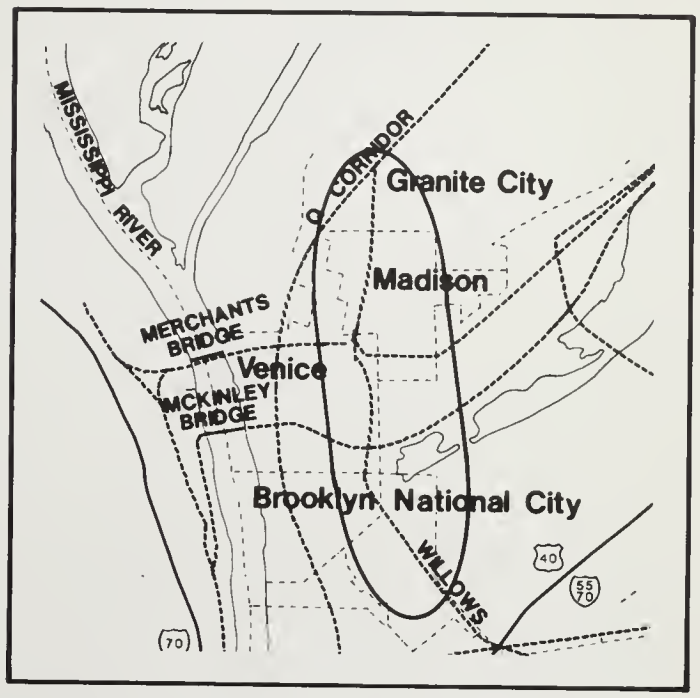


FIGURE 1 OF 6

WILLOWS CORRIDOR

2 YARD ALTERNATIVE



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 1 OF 6

WILLOWS CORRIDOR

2 YARD ALTERNATIVE

VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

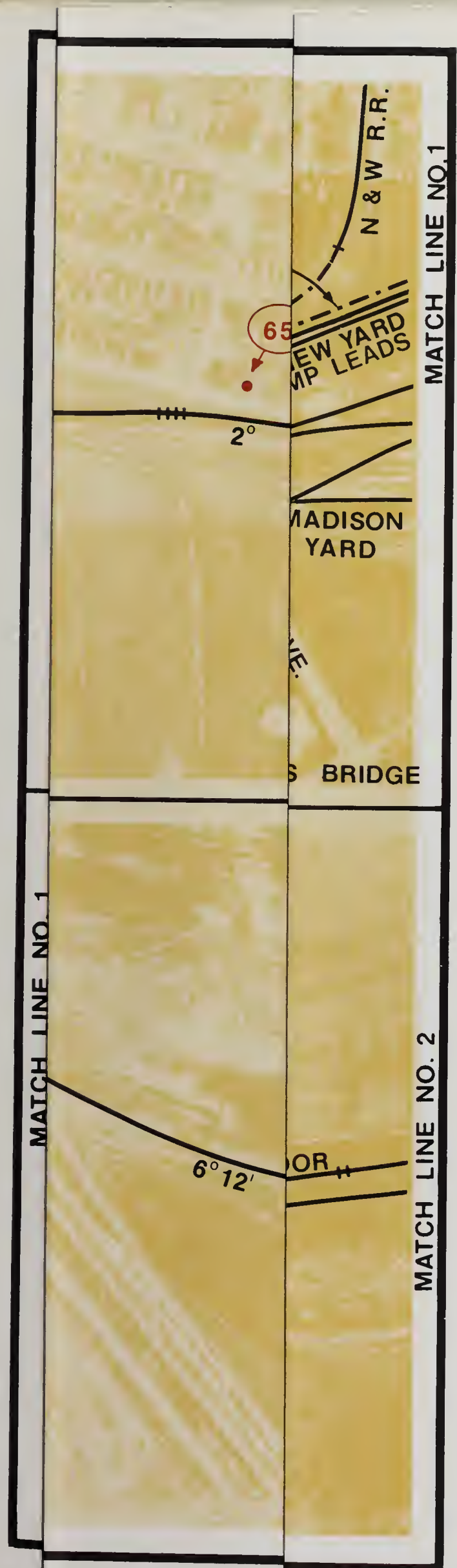
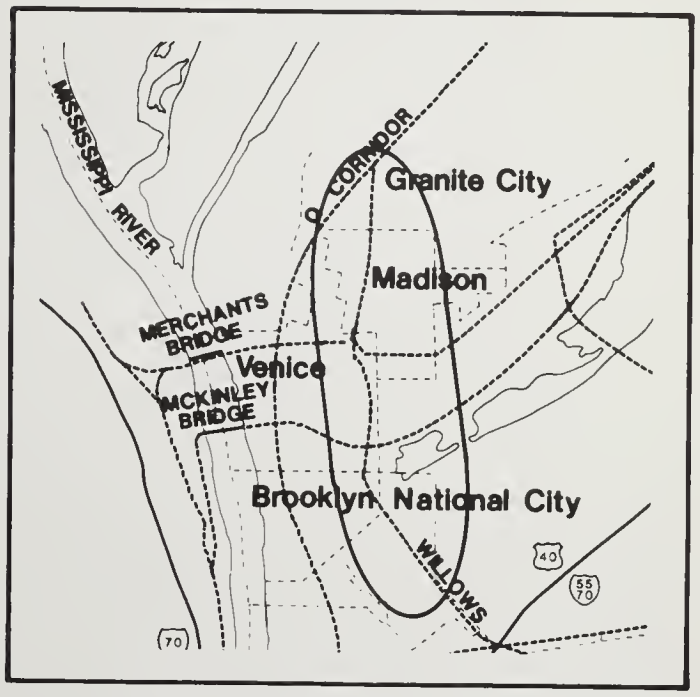


FIGURE 2 OF 6

WILLOWS CORRIDOR

3
YARD
ALTERNATIVE



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

400 200 0 400

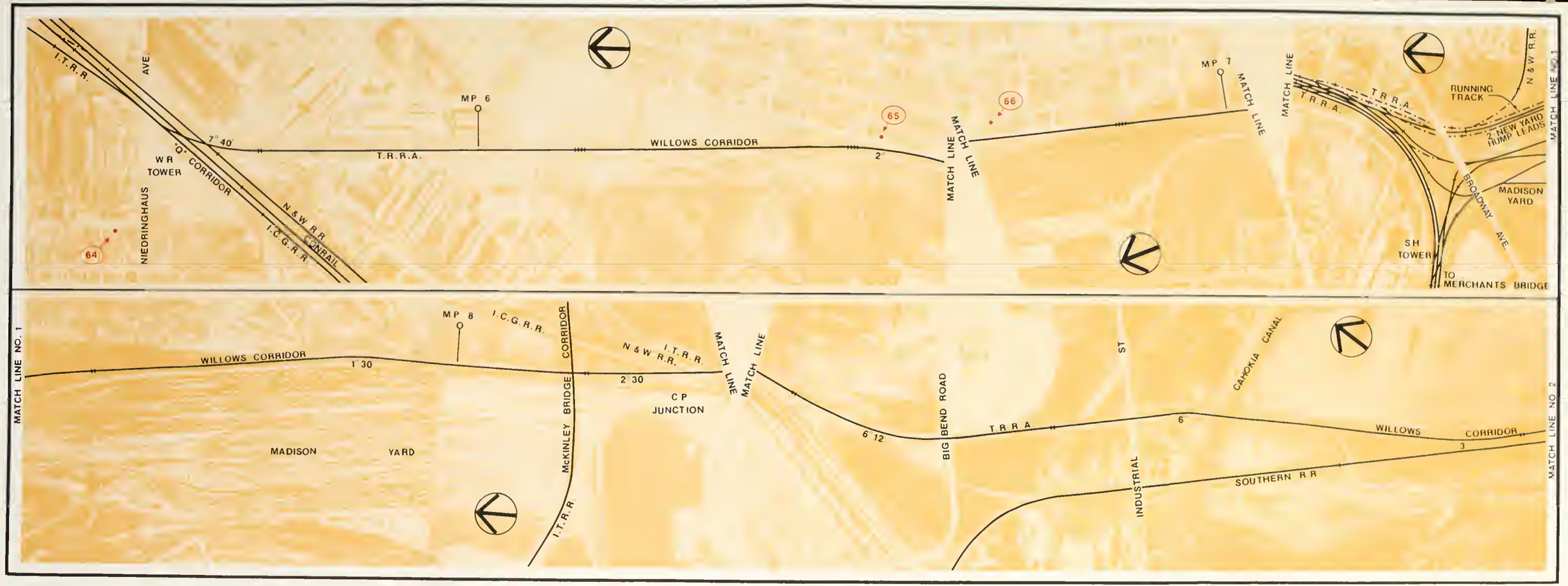
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 2 OF 6

WILLOWS CORRIDOR

3 YARD ALTERNATIVE



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

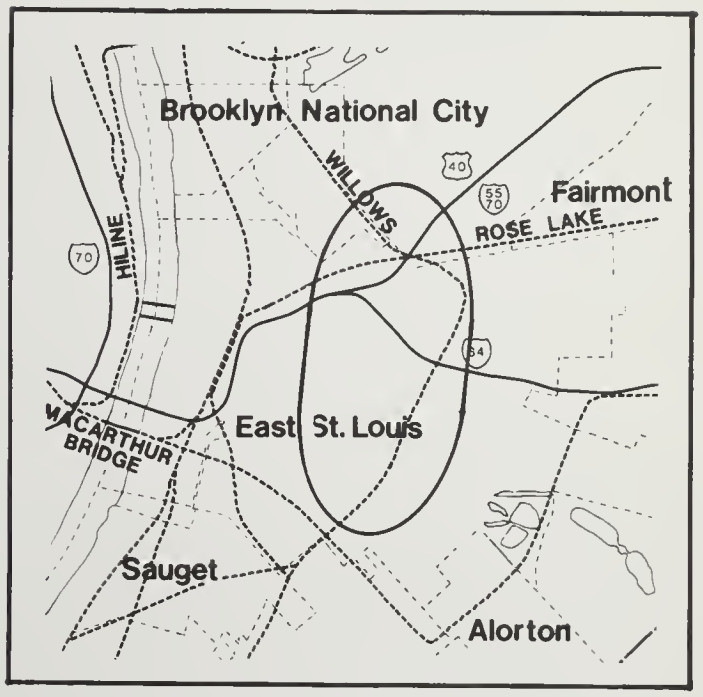
400 200 0 400

SCALE IN FEET

ST LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 3 OF 6

WILLOWS CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

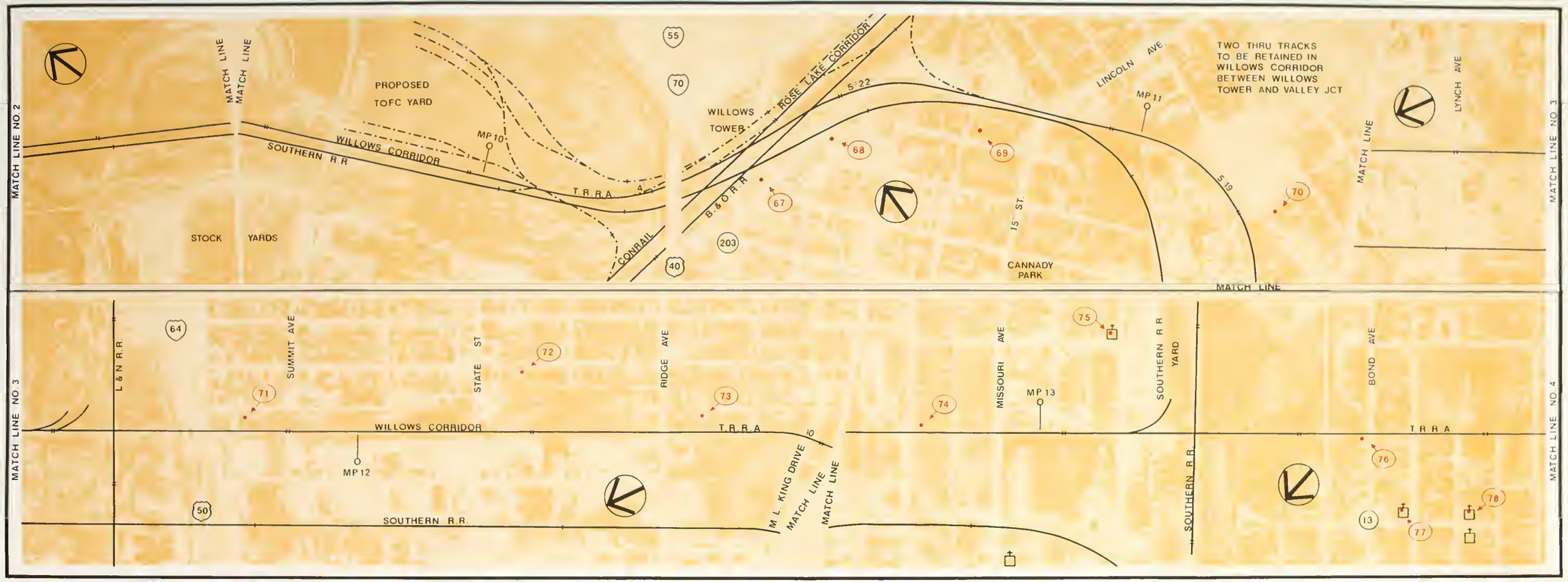
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 3 OF 6

WILLOWS CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

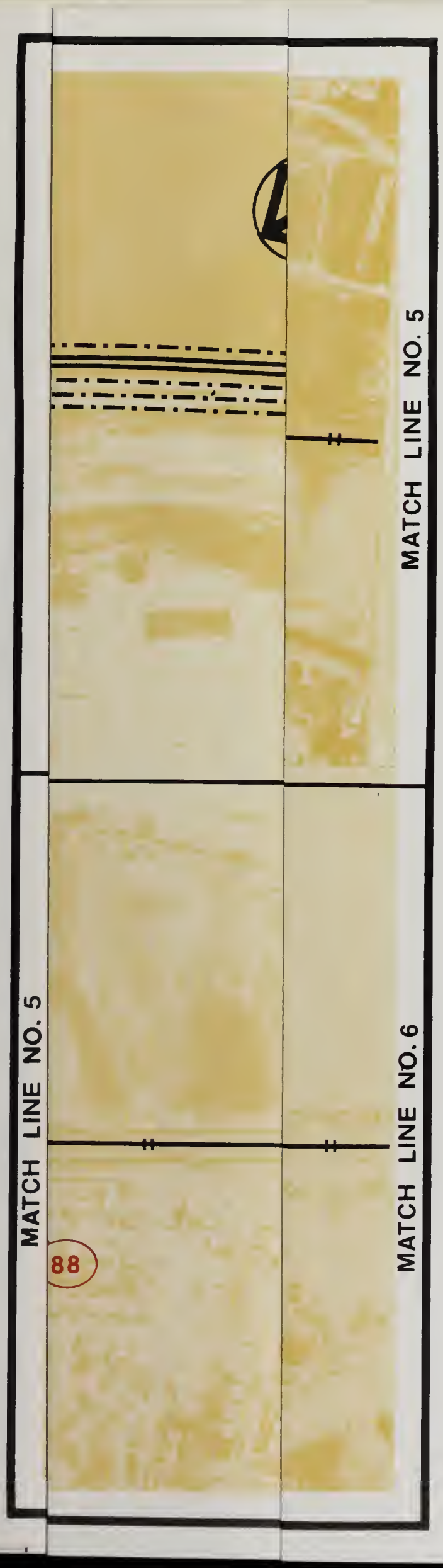
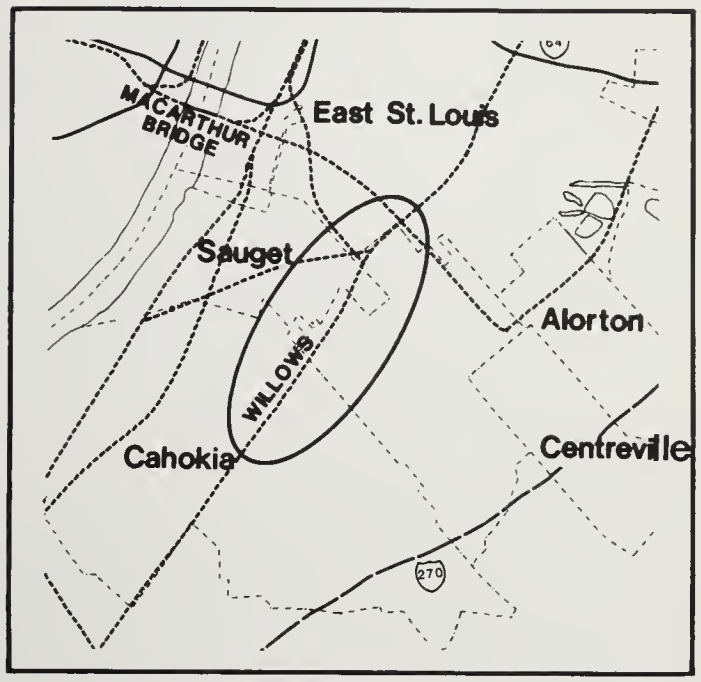


FIGURE 4 OF 6

WILLOWS CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

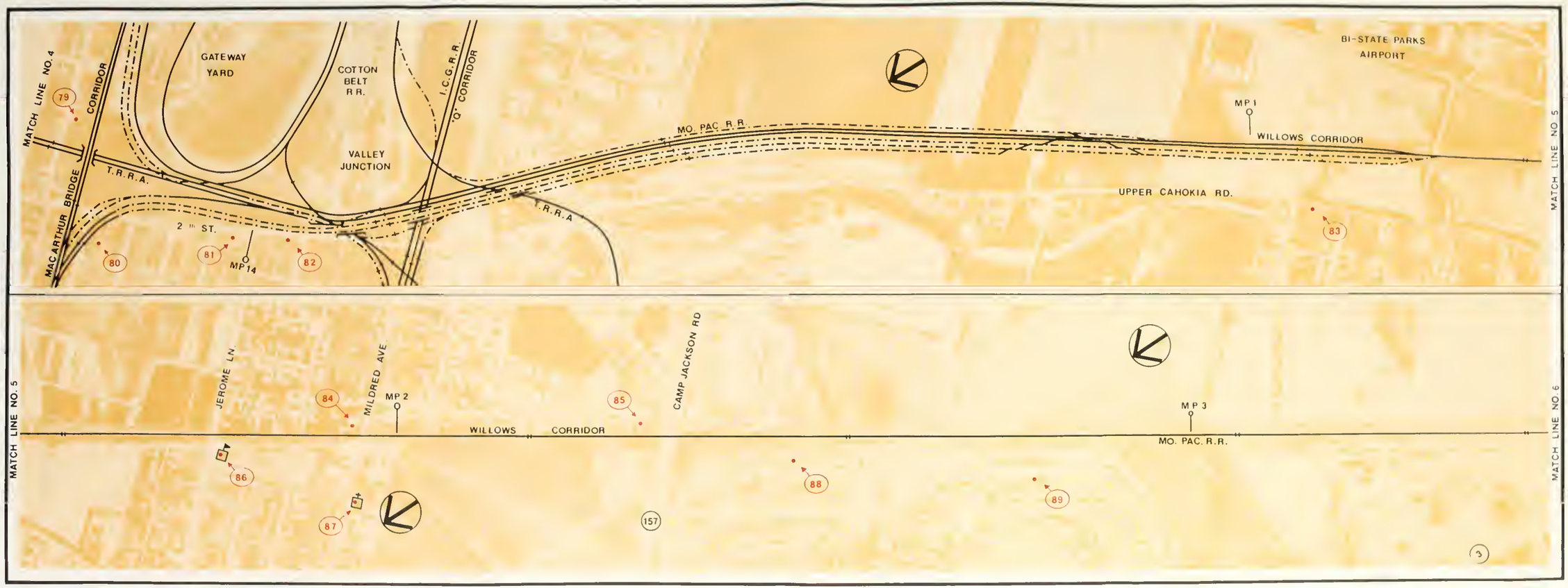
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 4 OF 6

WILLOWS CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

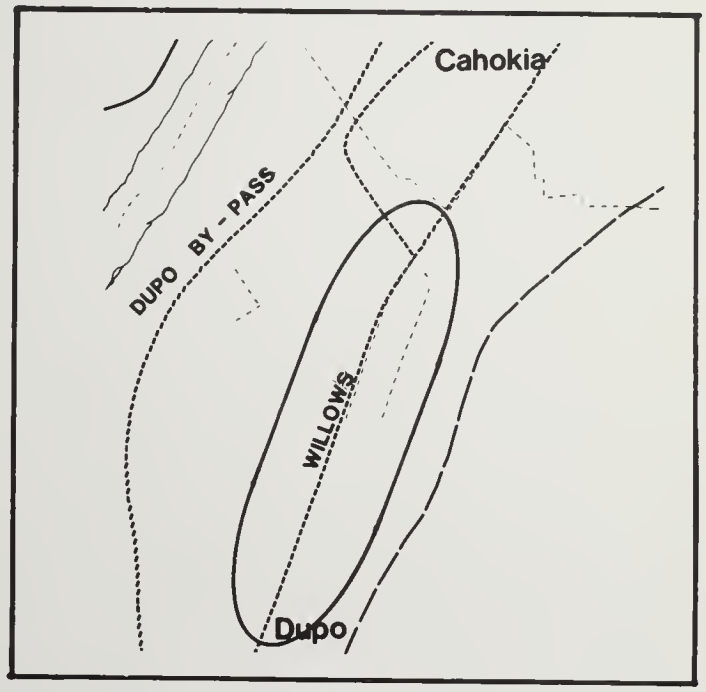
400 200 0 400

SCALE IN FEET

ST LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 5 OF 6

WILLOWS CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

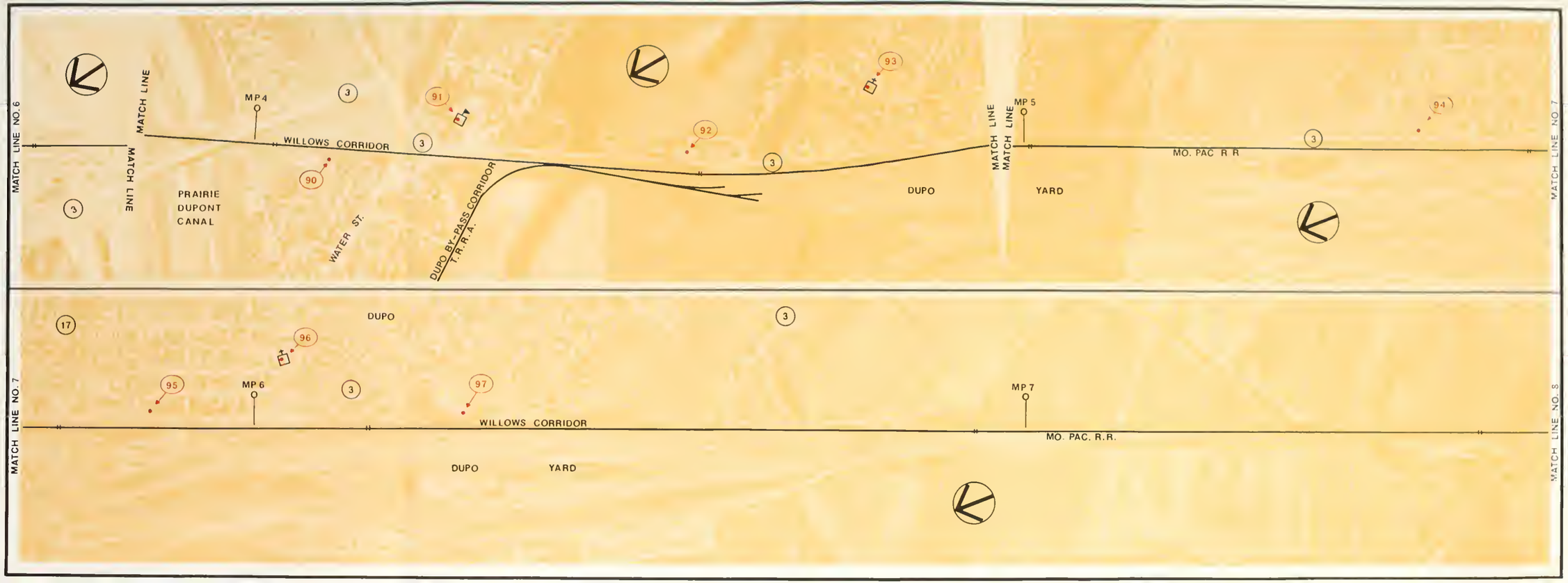
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 5 OF 6

WILLOWS CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

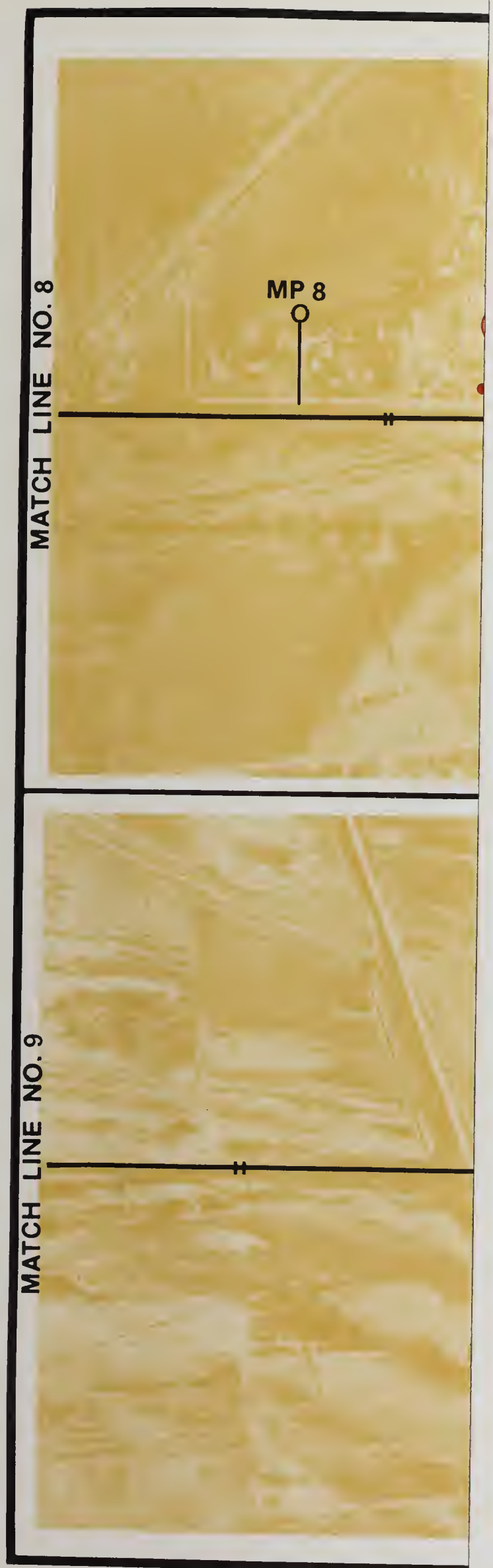
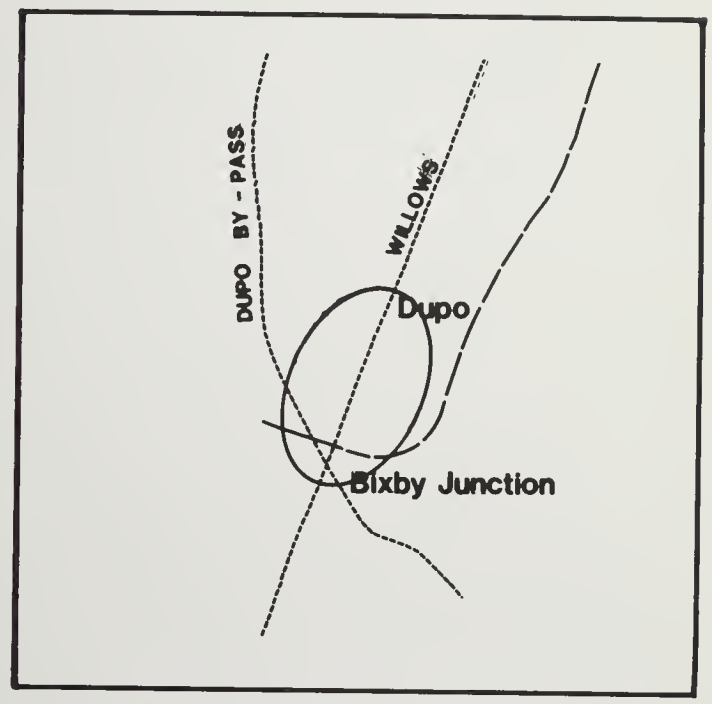


FIGURE 6 OF 6

WILLOWS CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

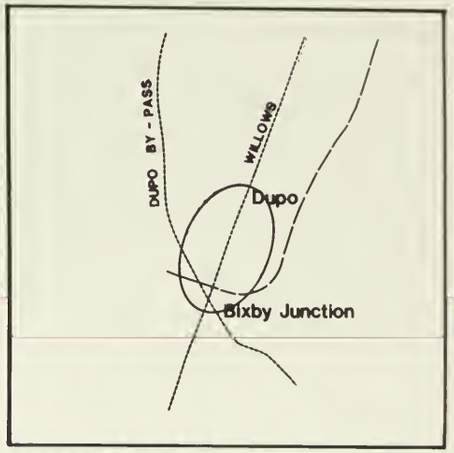
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 6 OF 6

WILLOWS CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

400 200 0 400

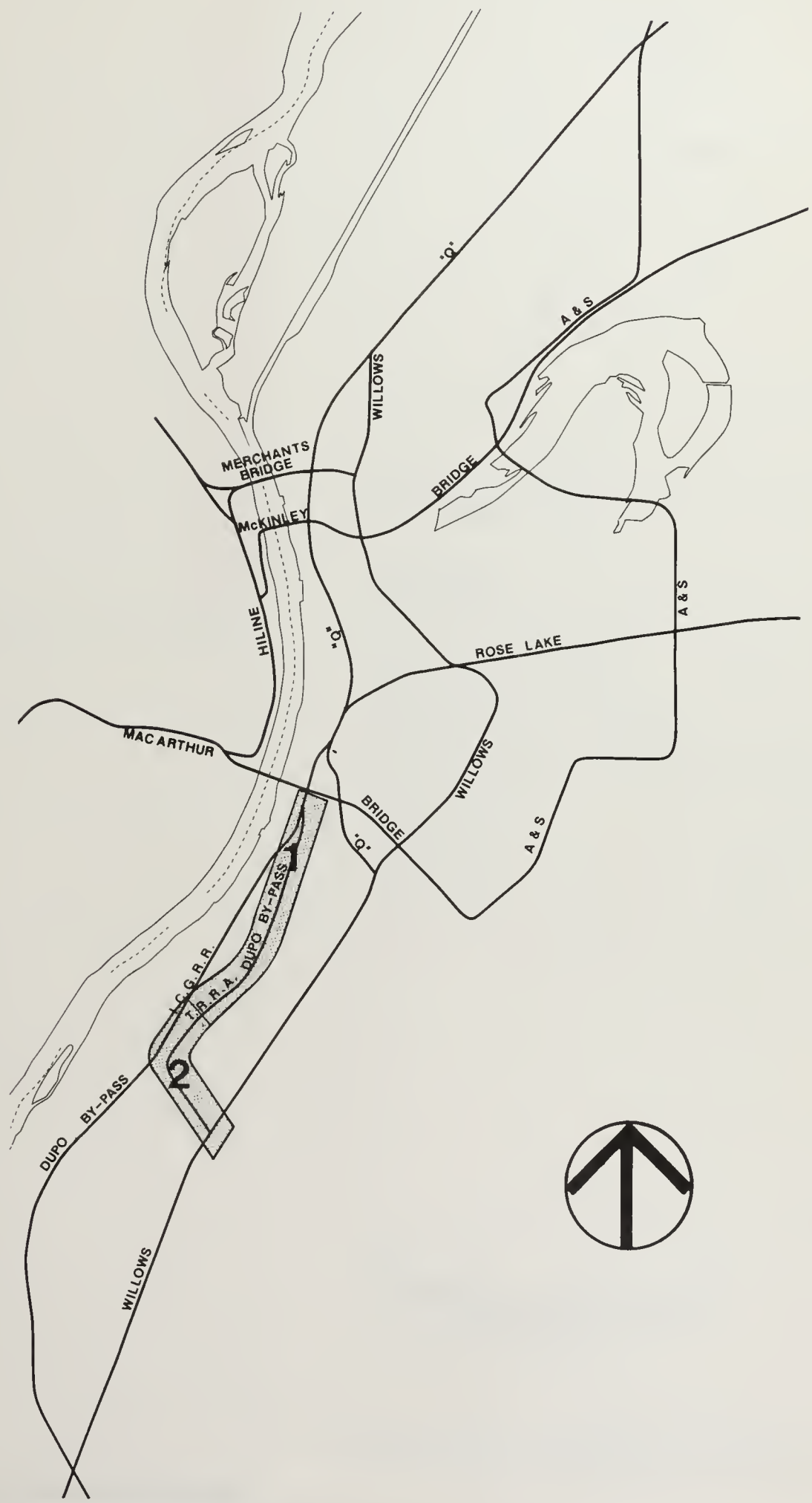
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section V

DUPO BY-PASS CORRIDOR (T.R.R.A.)

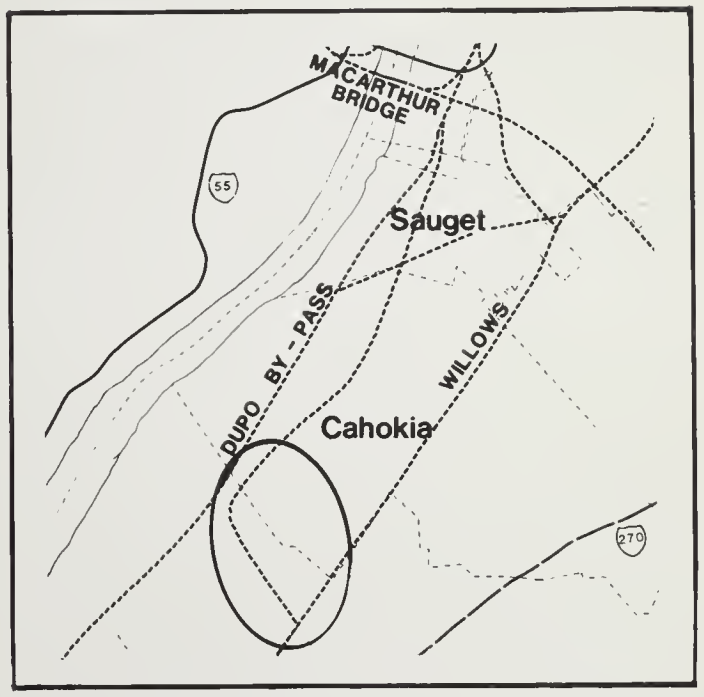
KEY MAP



MATCH LINE NO. 2

FIGURE 2 OF 2

DUPO BY-PASS CORRIDOR T.R.R.A.



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

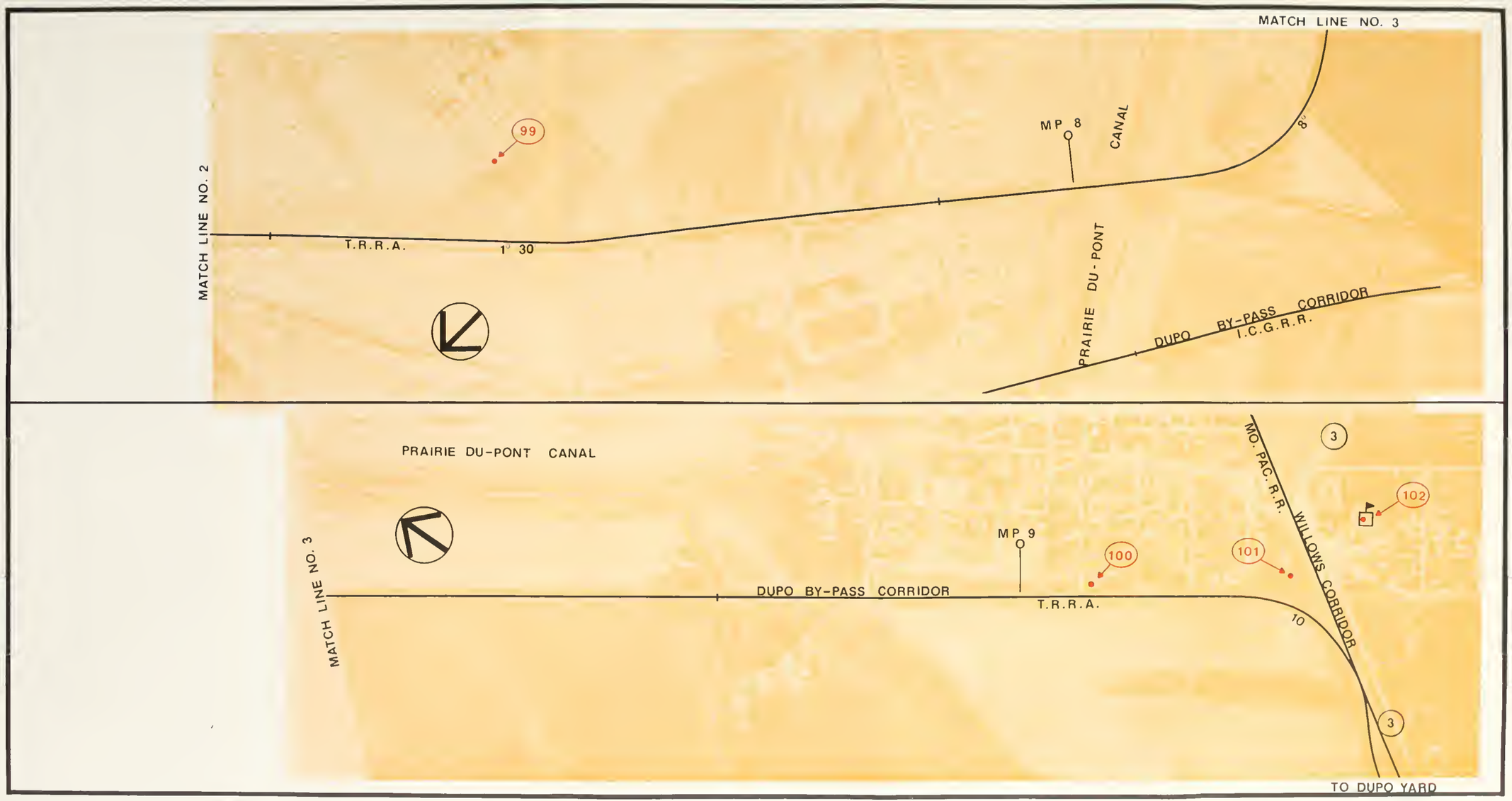
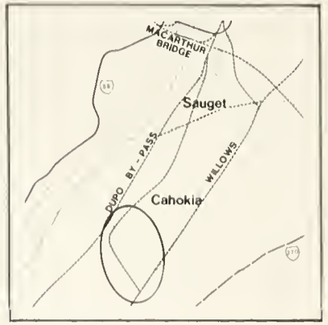


FIGURE 2 OF 2

DUPO BY-PASS CORRIDOR T.R.R.A.



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

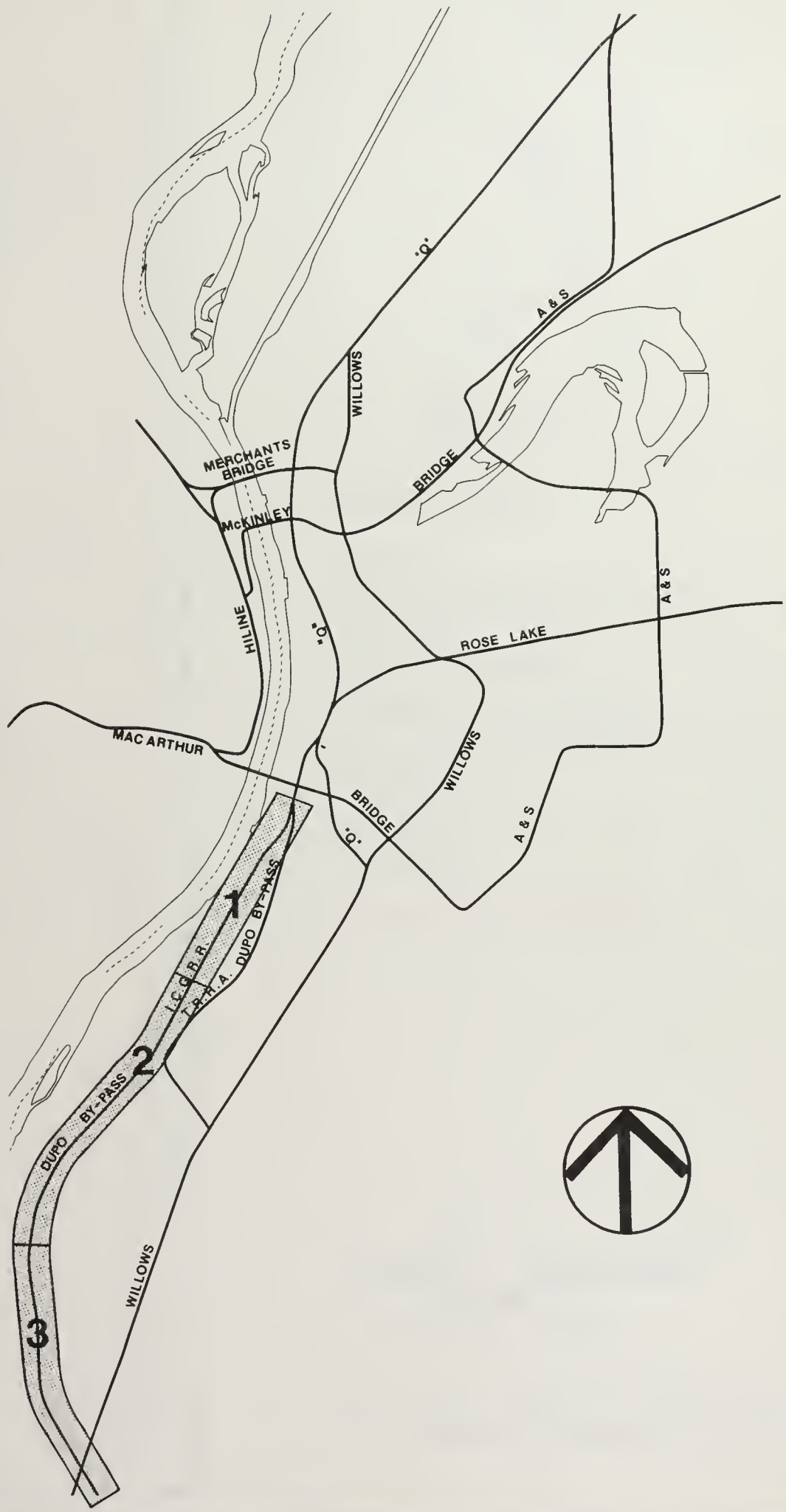
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section VI

DUPO BY-PASS CORRIDOR (I.C.G.R.R.)

KEY MAP



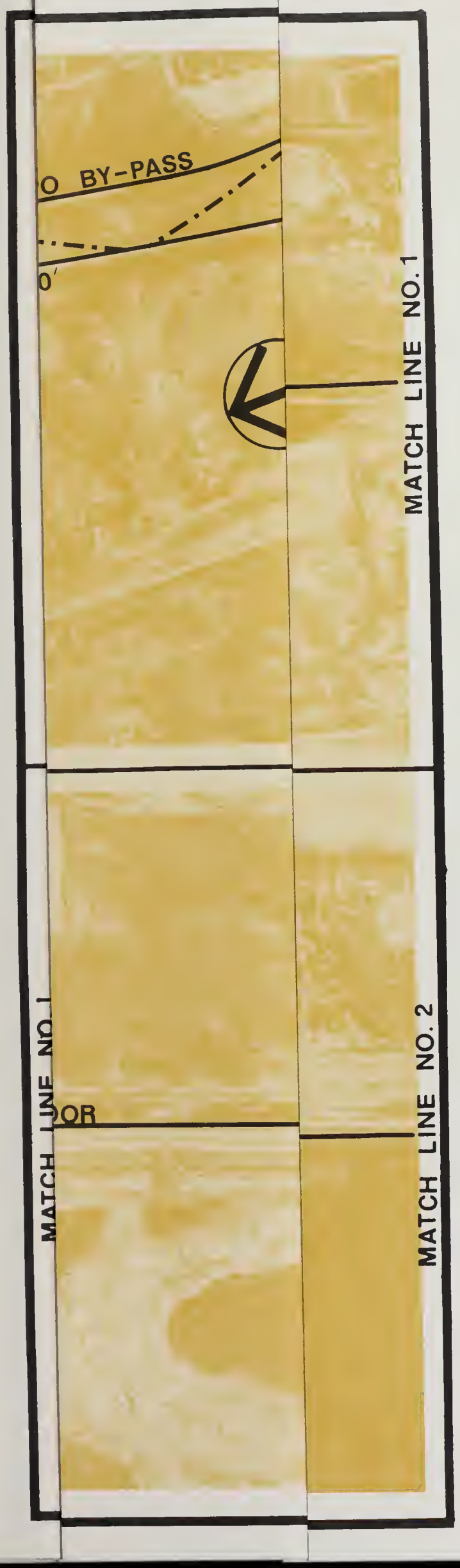
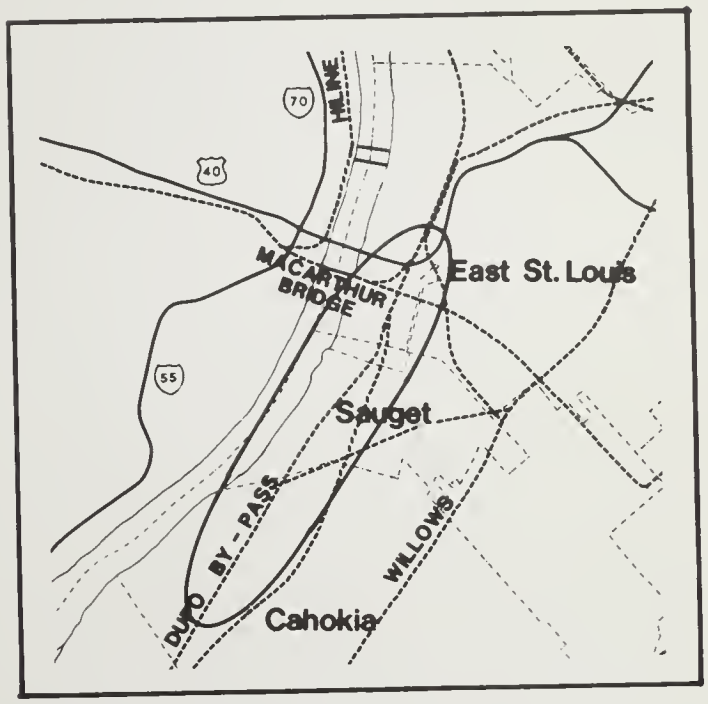


FIGURE 1 OF 3

DUPO BY-PASS CORRIDOR I.C.G.R.R.



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 1 OF 3

DUPO BY-PASS CORRIDOR I.C.G.R.R.

VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

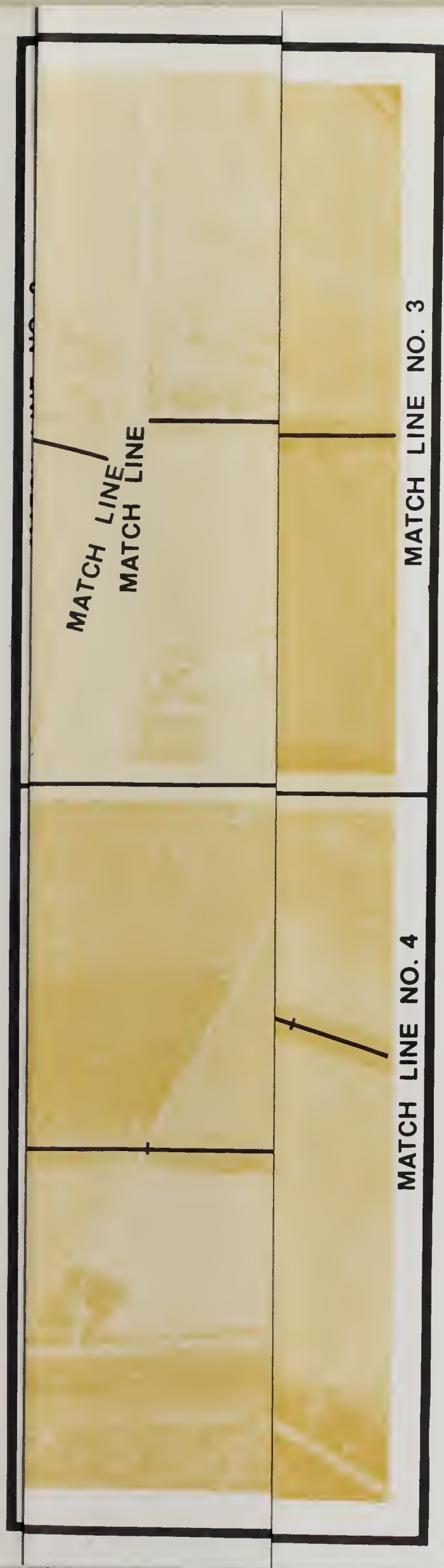
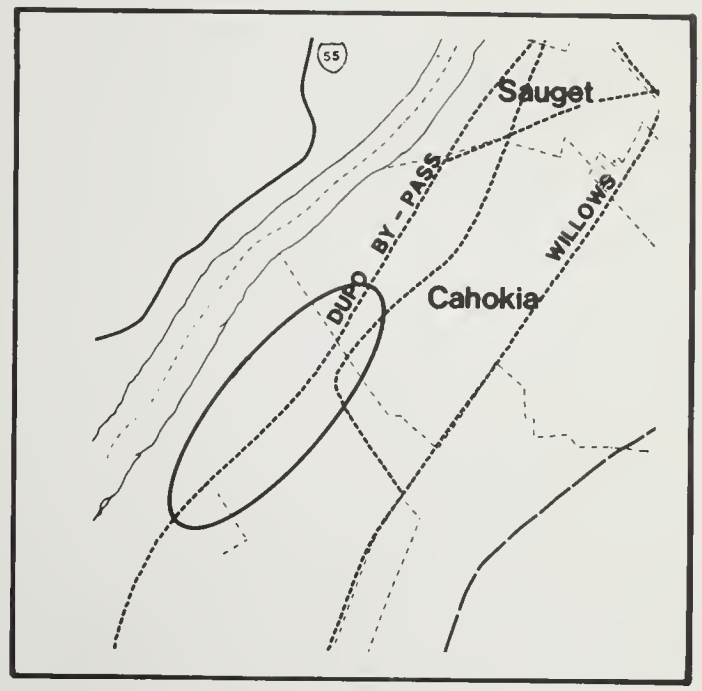


FIGURE 2 OF 3

DUPO BY-PASS CORRIDOR I.C.G.R.R.



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section X Section XI Section VII Section VIII Section IX

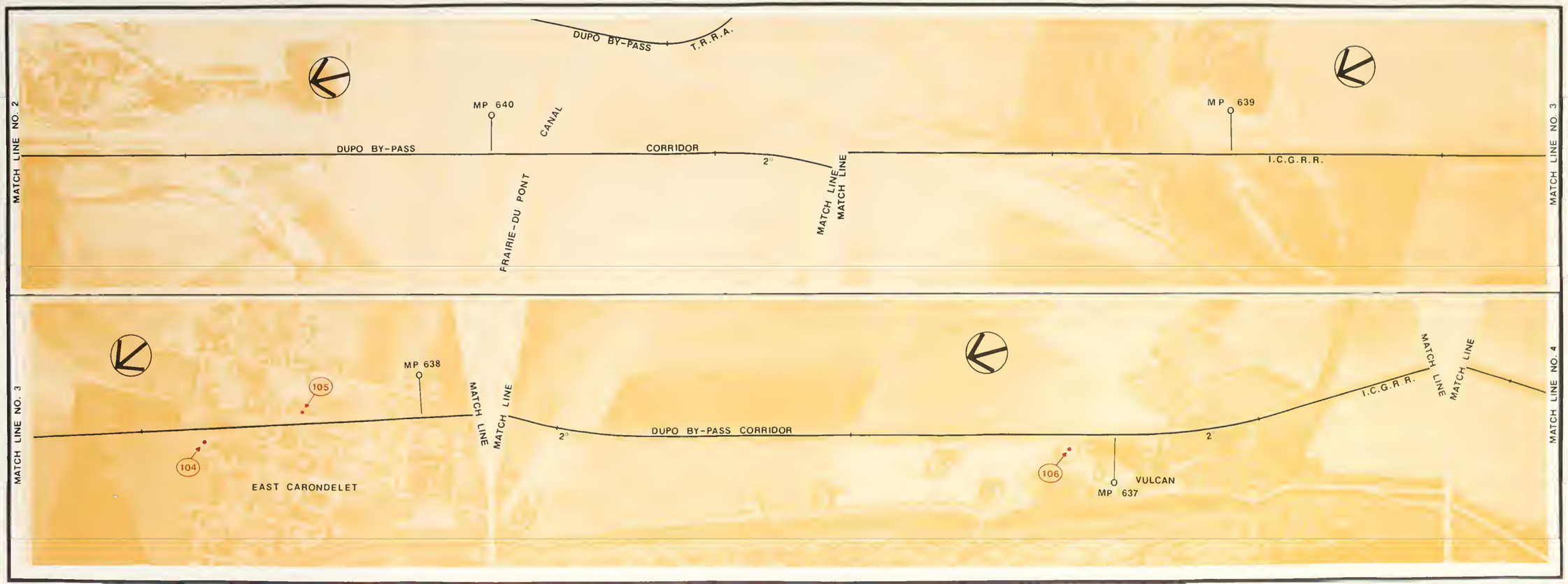


FIGURE 2 OF 3

DUPO BY-PASS CORRIDOR I.C.G.R.R.

VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

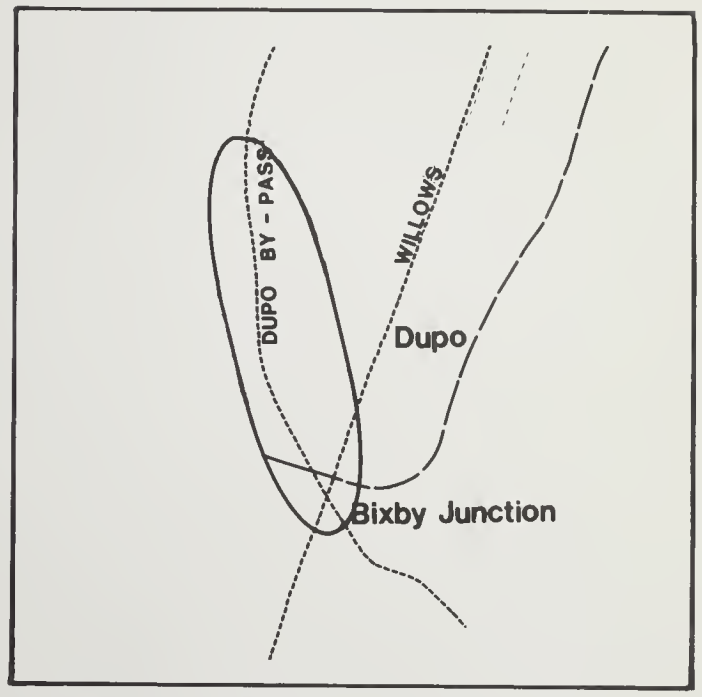
400 200 0 400

SCALE IN FEET

ST LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 3 OF 3

DUPO BY-PASS CORRIDOR I.C.G.R.R.



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

400 200 0 400

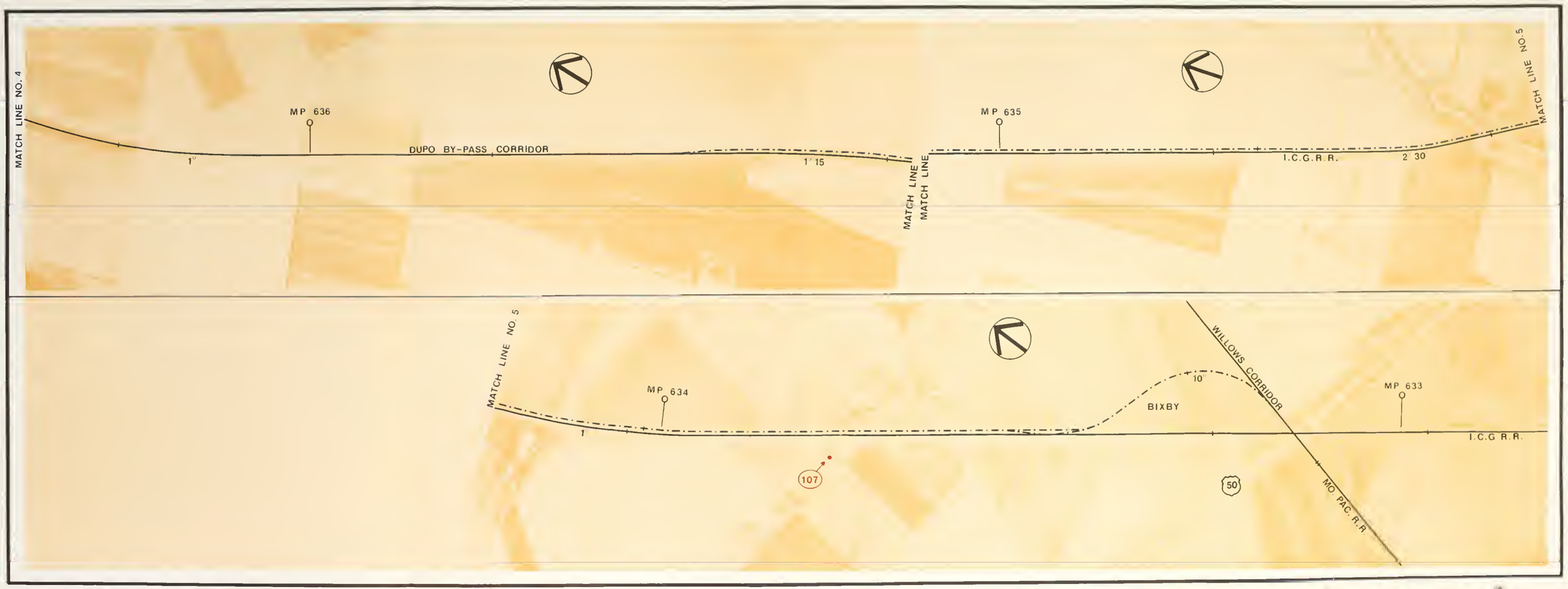
SCALE IN FEET

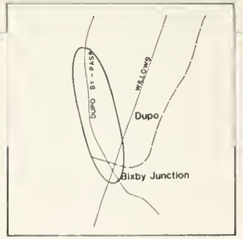
ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section X
Section XI
Section VII
Section VIII
Section IX

FIGURE 3 OF 3

DUPO BY-PASS CORRIDOR I.C.G.R.R.





VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

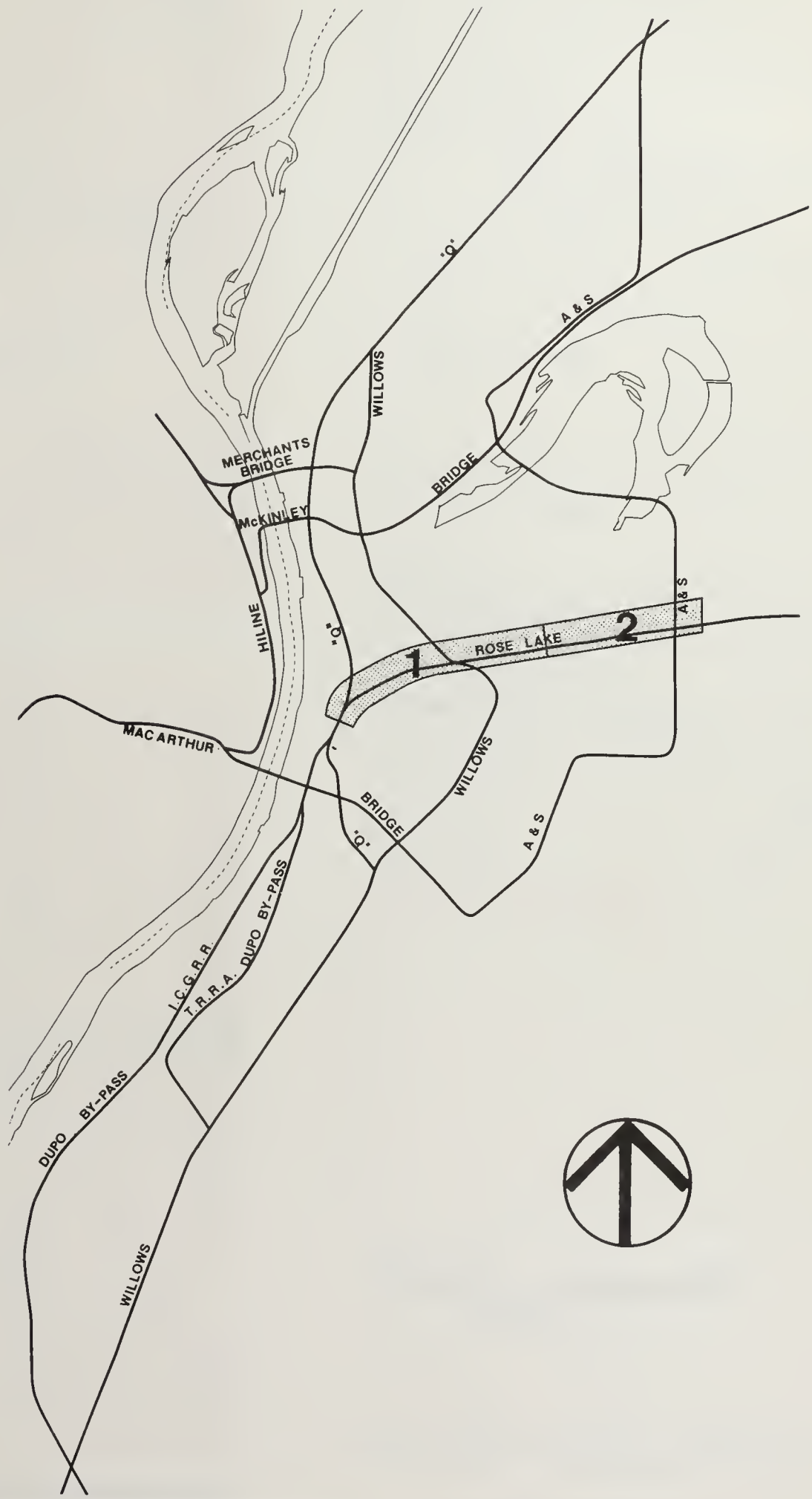
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section VII

ROSE LAKE CORRIDOR

KEY MAP



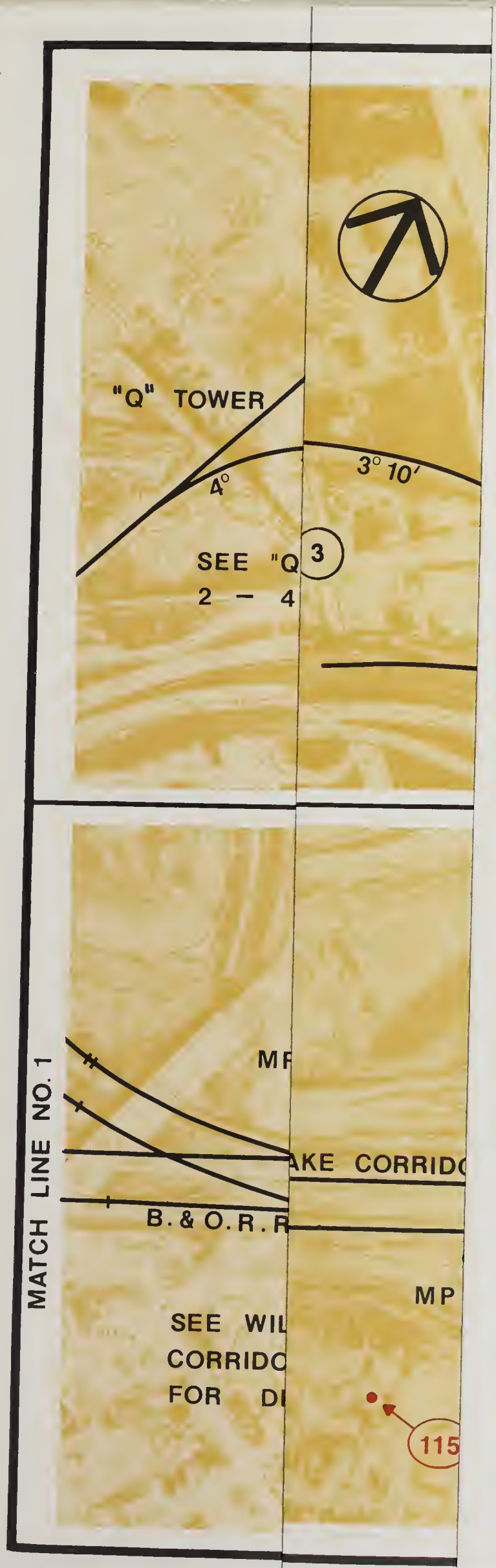
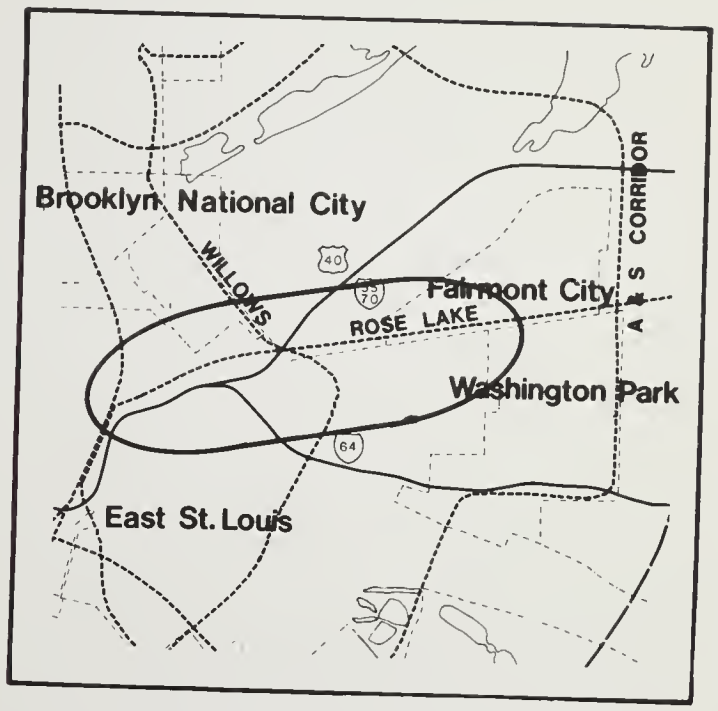


FIGURE 1 OF 2

ROSE LAKE CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

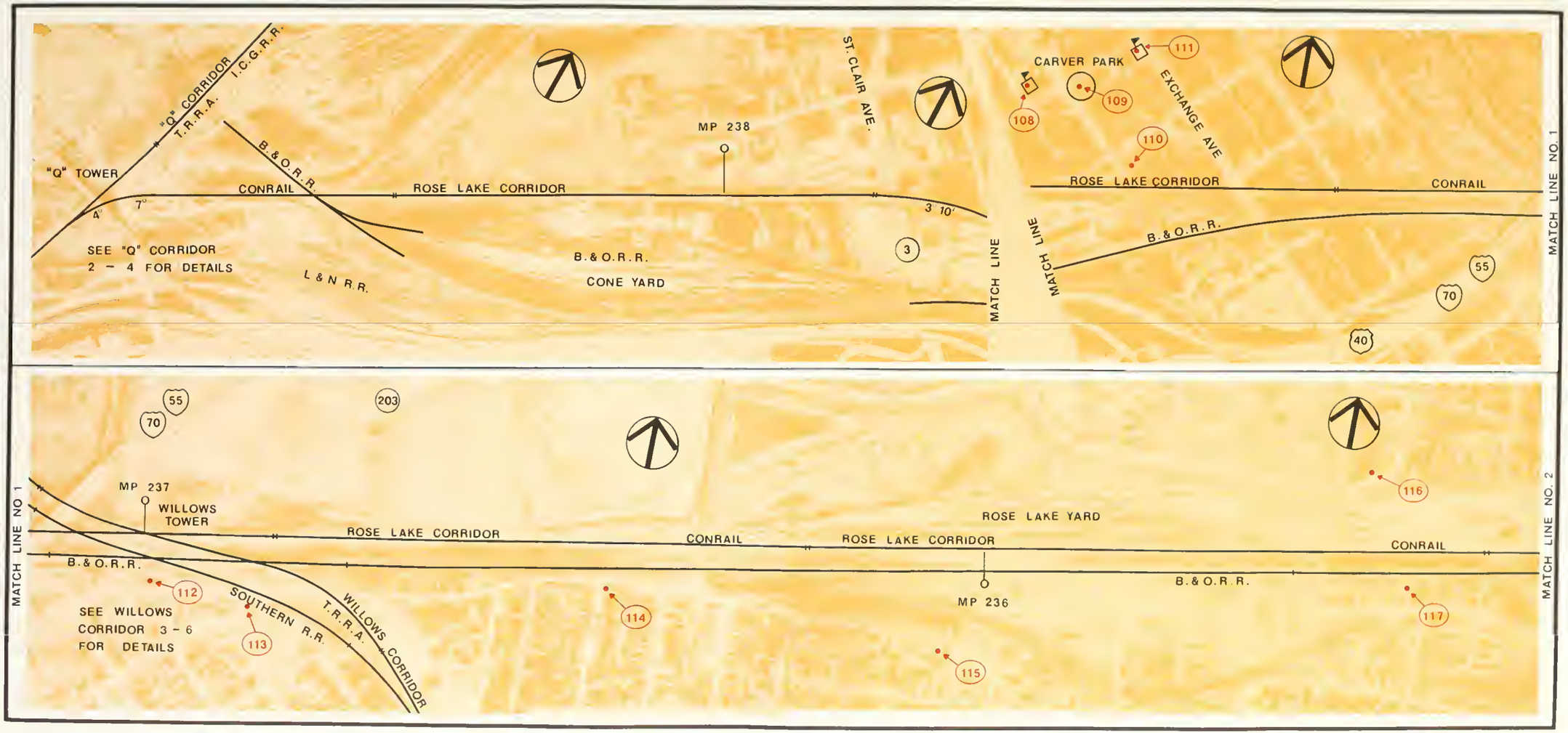
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP / ENVIRODYNE / KNIGHT

FIGURE 1 OF 2

ROSE LAKE CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

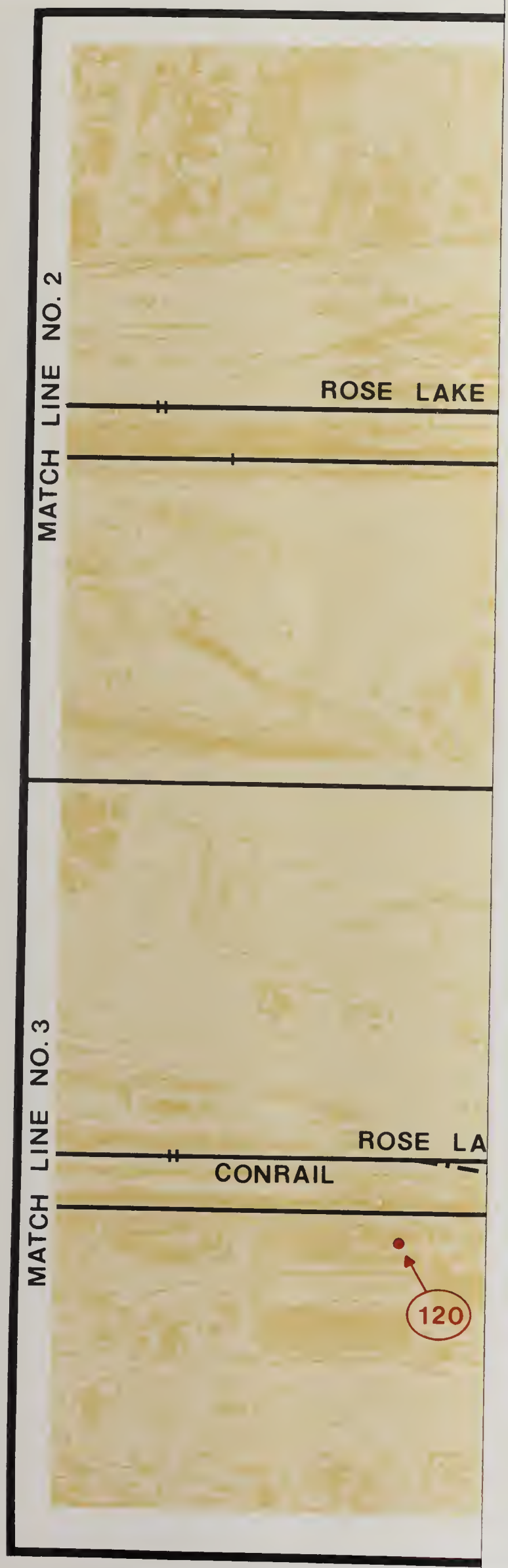
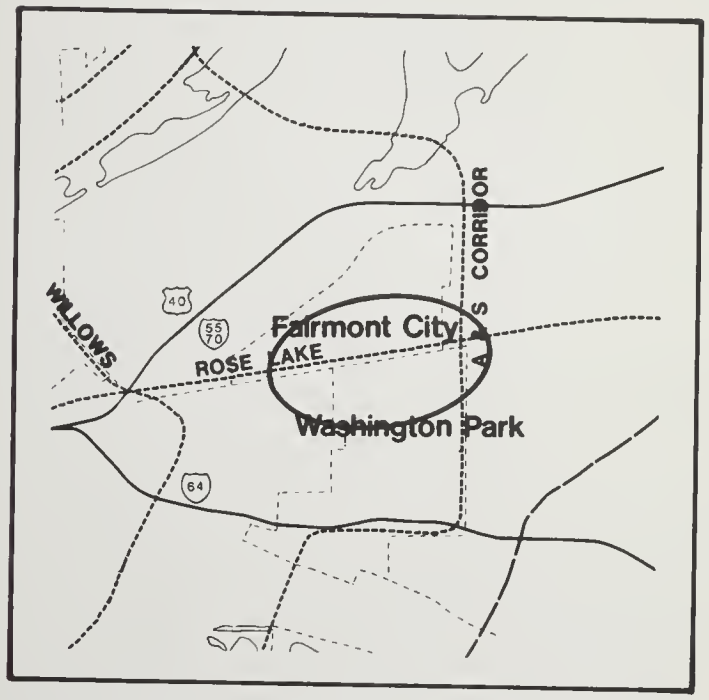


FIGURE 2 OF 2

ROSE LAKE CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section X

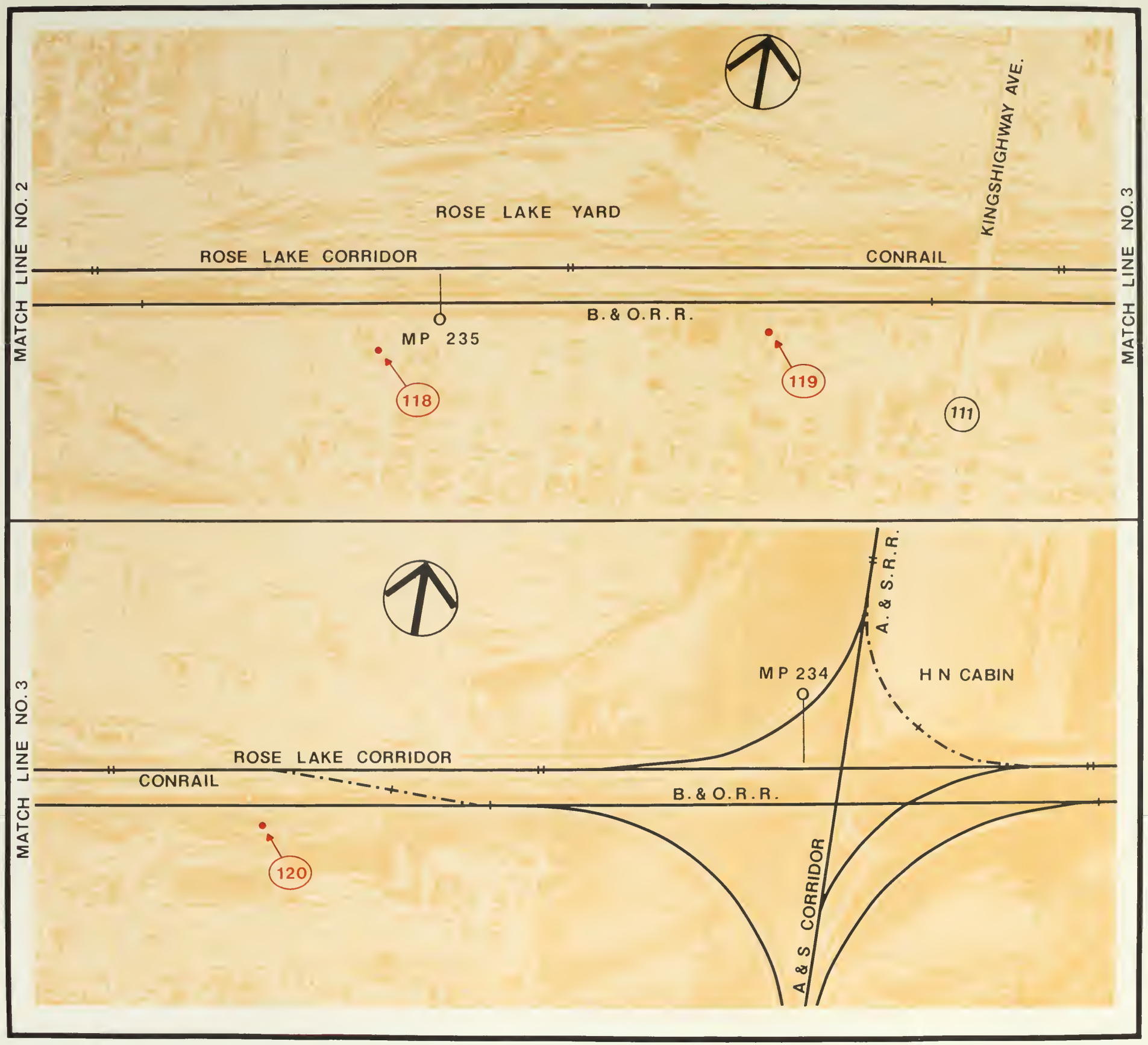
Section VI

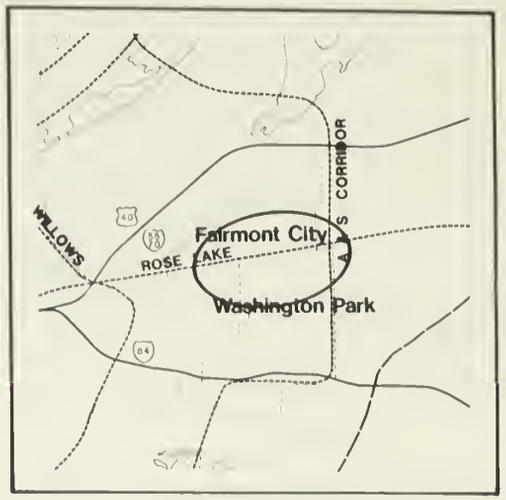
Section VIII

Section IX

FIGURE 2 OF 2

ROSE LAKE CORRIDOR





VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section VIII

Section X

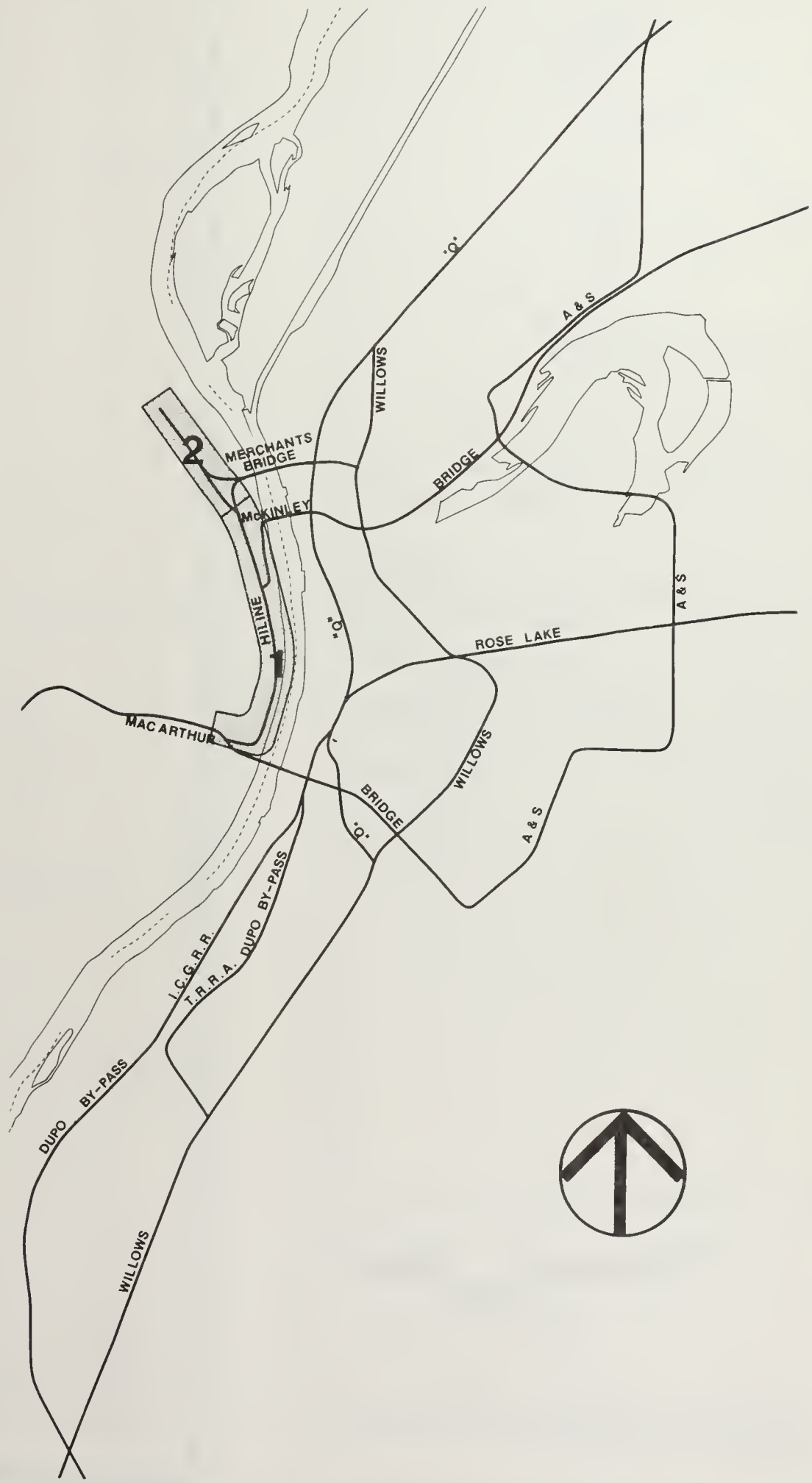
Section XI

Section VIII

Section IX

HILINE CORRIDOR

KEY MAP



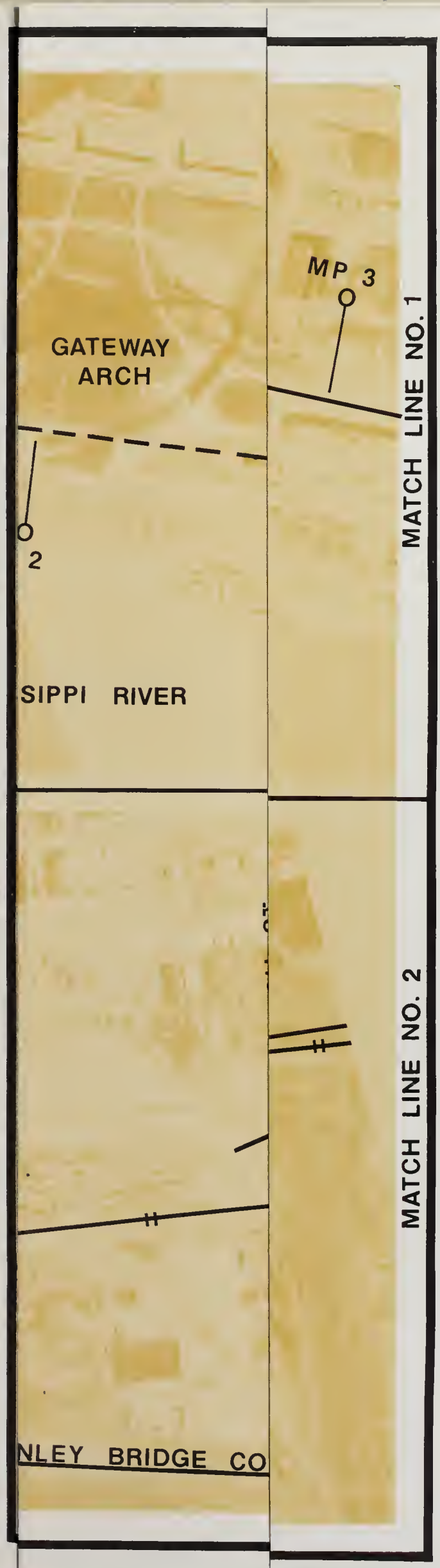
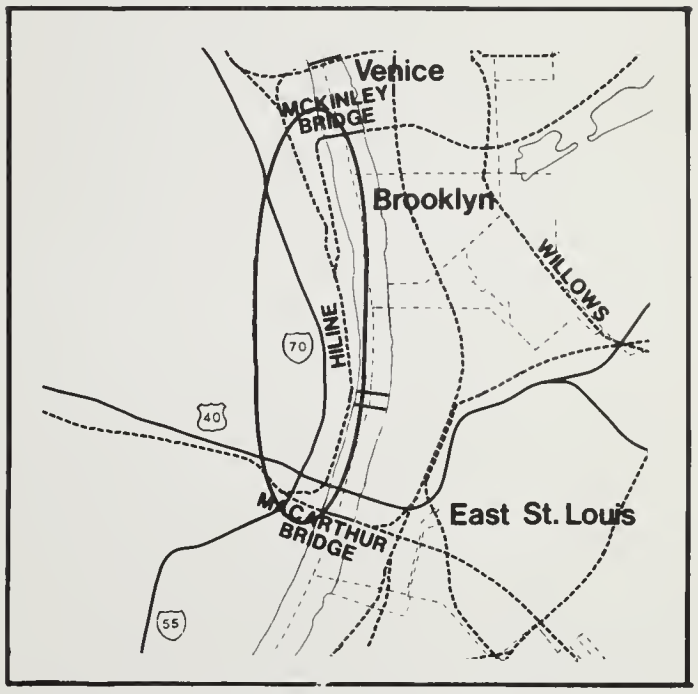


FIGURE 1 OF 2

HILINE CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH

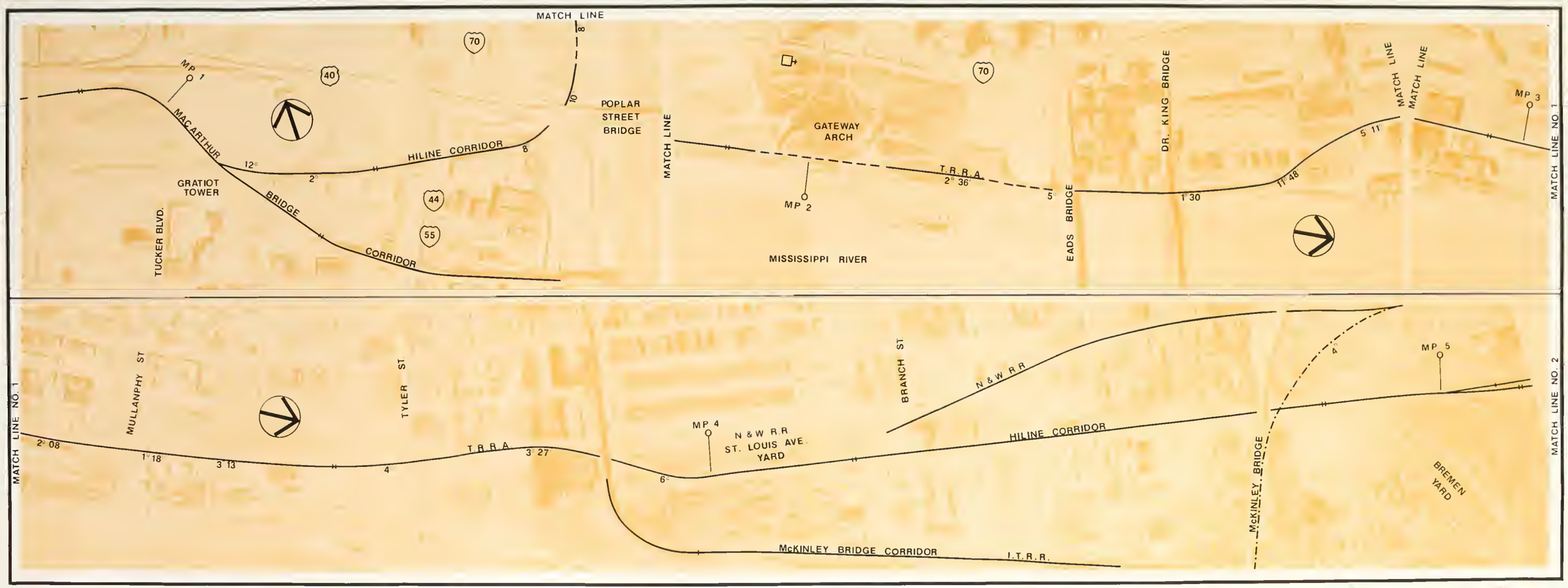
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 1 OF 2

HILINE CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH

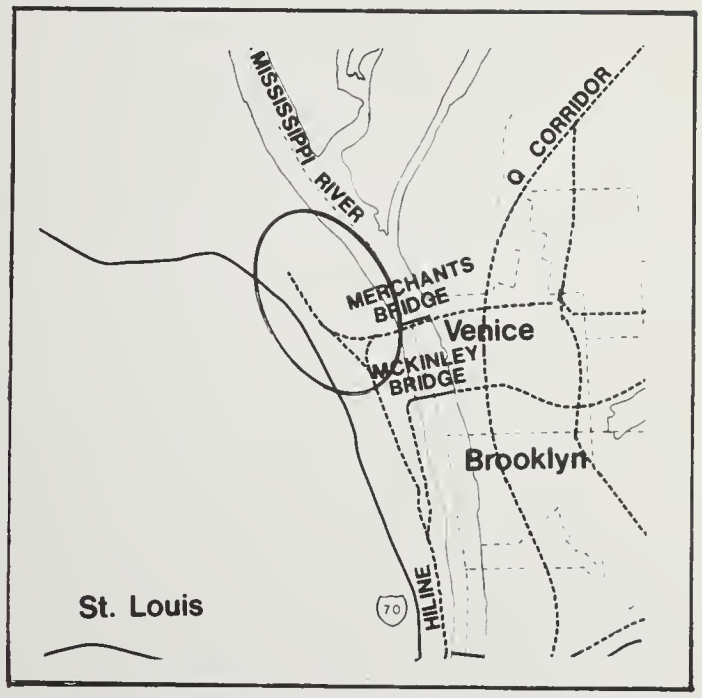
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 2 OF 2

HILINE CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL

PROPOSED RAIL

NUMBER OF TRACKS
(Designated by Vertical Lines)

MILEPOST

SCHOOL

CHURCH

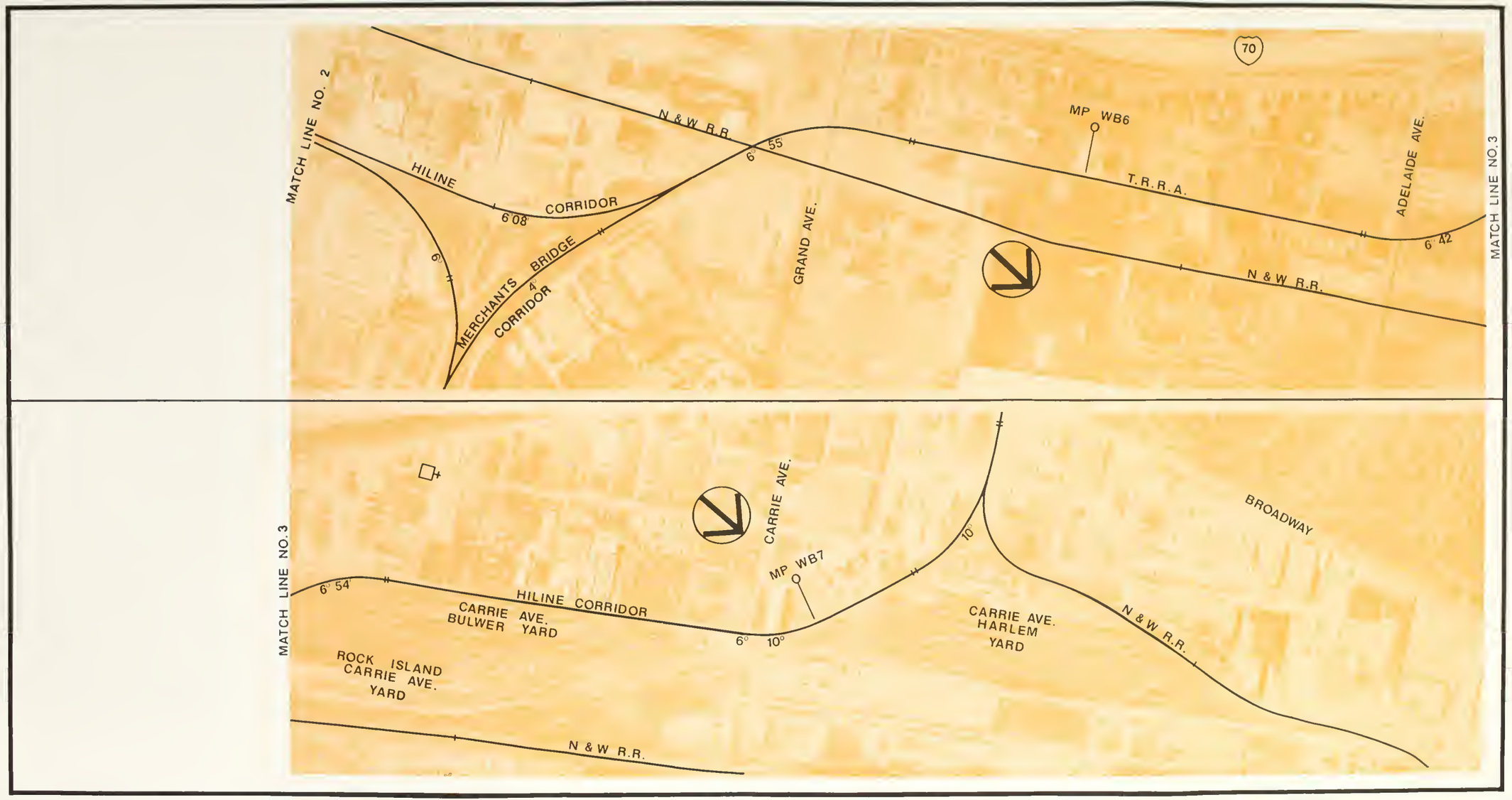
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 2 OF 2

HILINE CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section IX

Section X

Section XI

Section IX

MAC ARTHUR BRIDGE CORRIDOR

KEY MAP

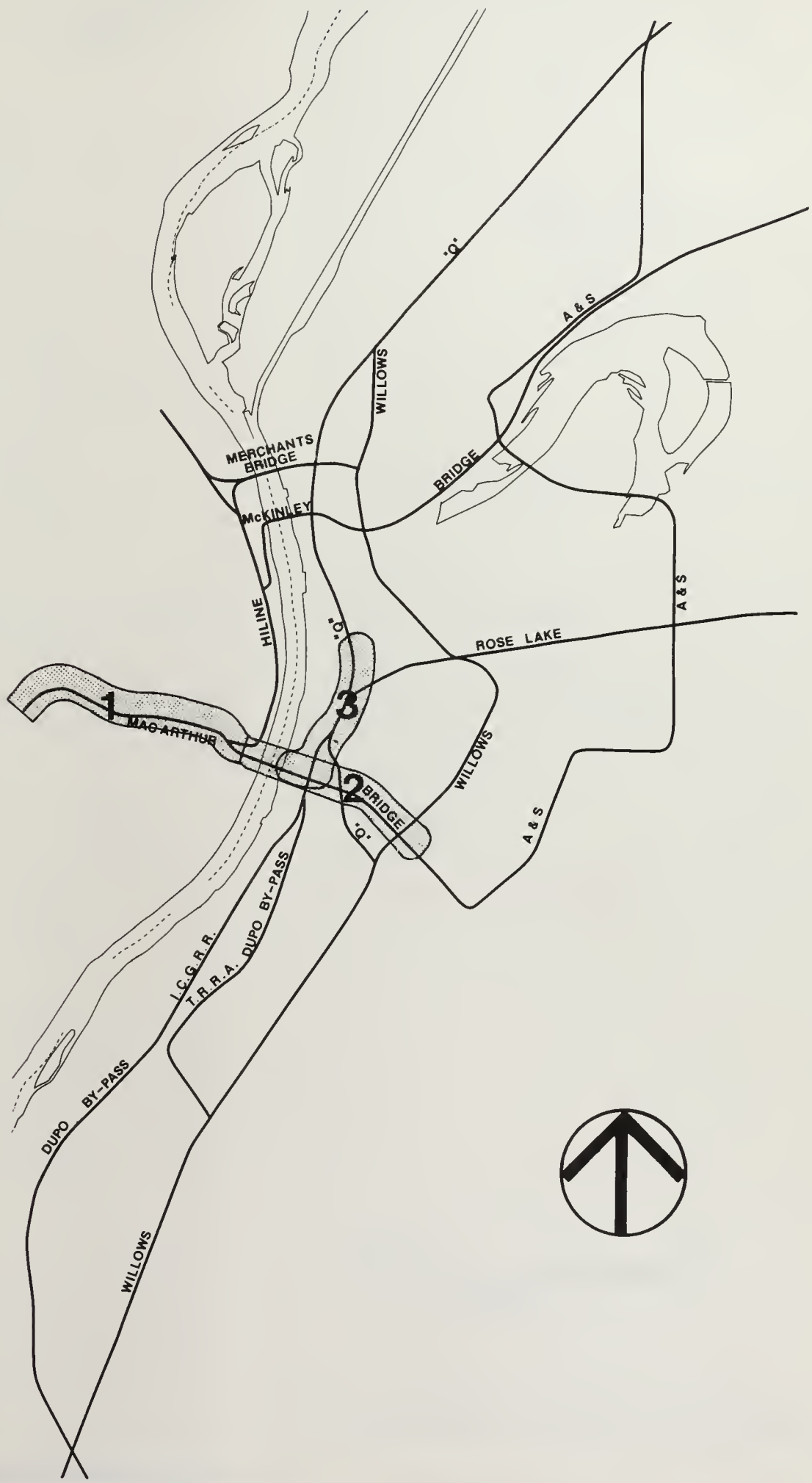
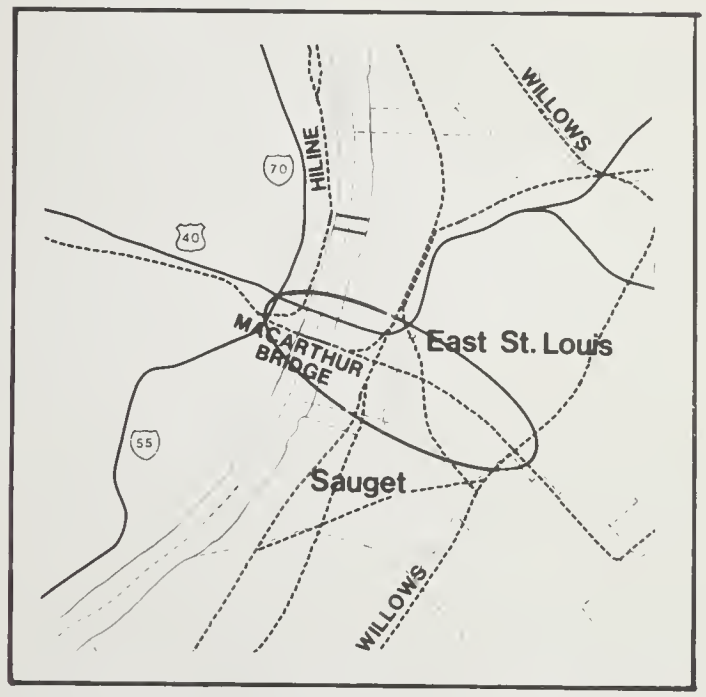


FIGURE 2 OF 3

MAC ARTHUR BRIDGE CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

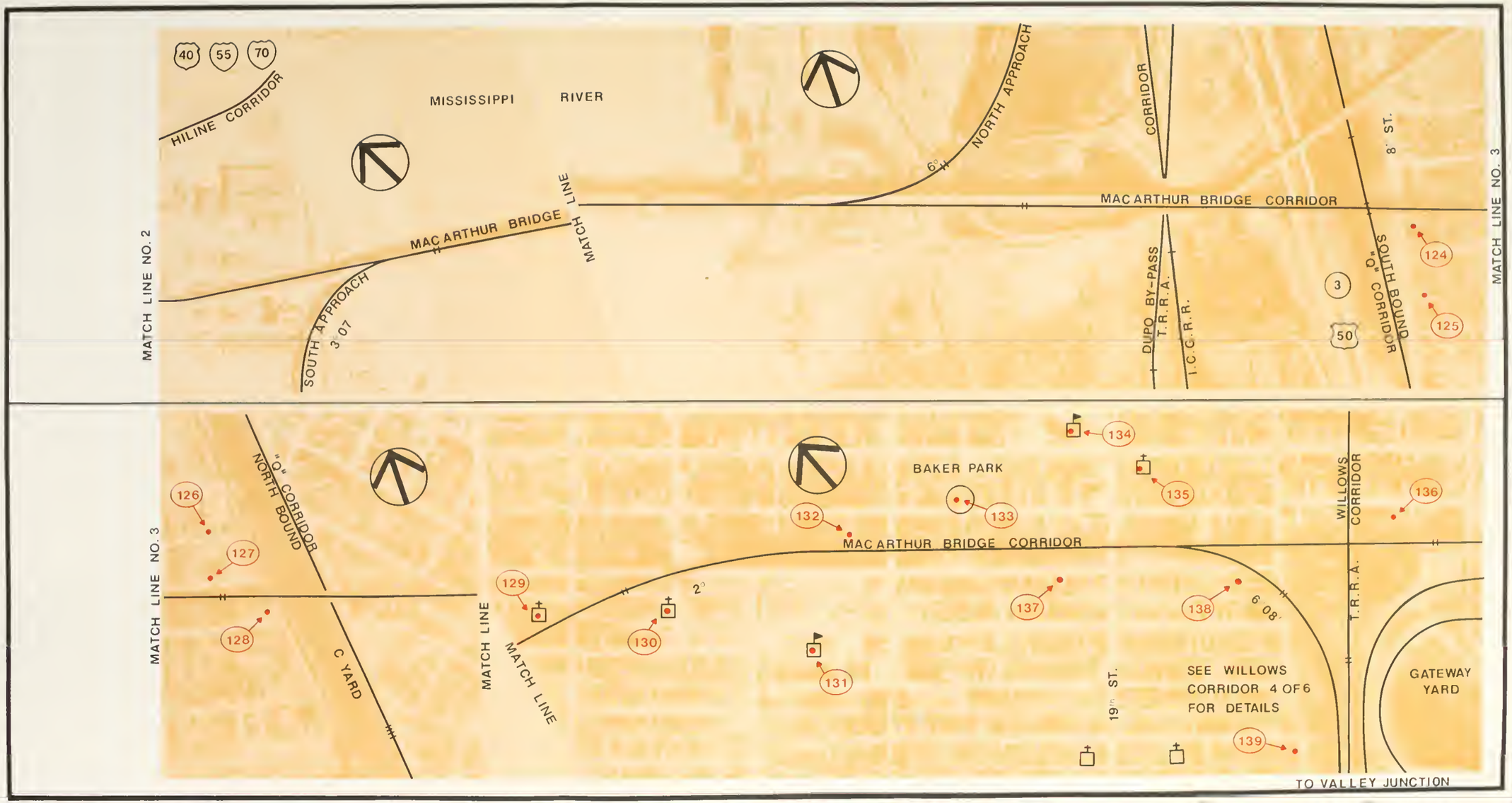
400 200 0 400

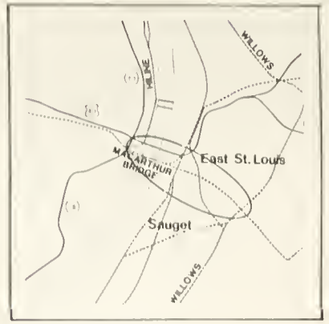
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 2 OF 3

MAC ARTHUR BRIDGE CORRIDOR





VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

Section X

Section XI

Section X

MERCHANTS BRIDGE CORRIDOR

KEY MAP

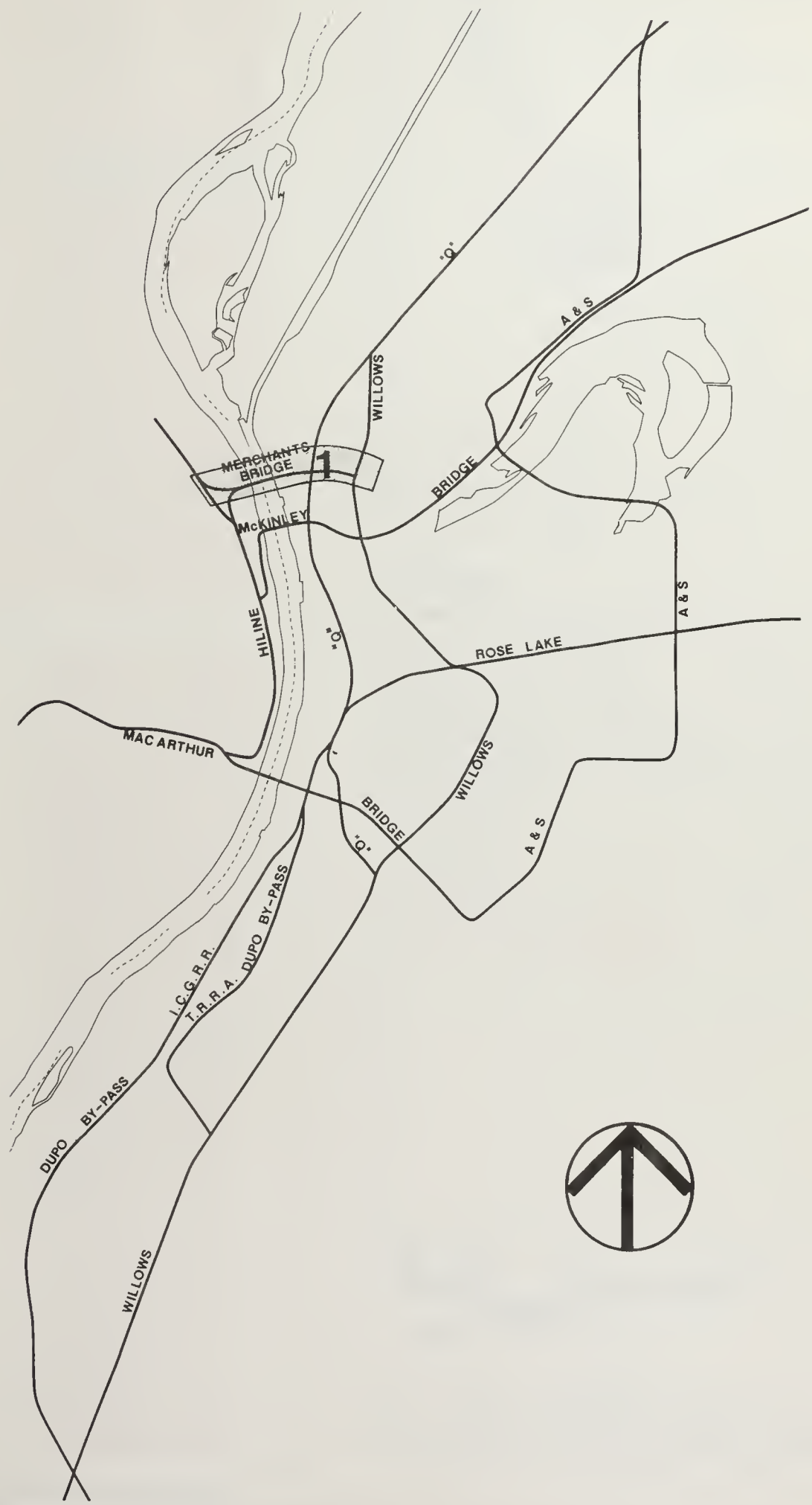


FIGURE 1 OF 1

MERCHANTS BRIDGE CORRIDOR

VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
NOISE RECEPTOR

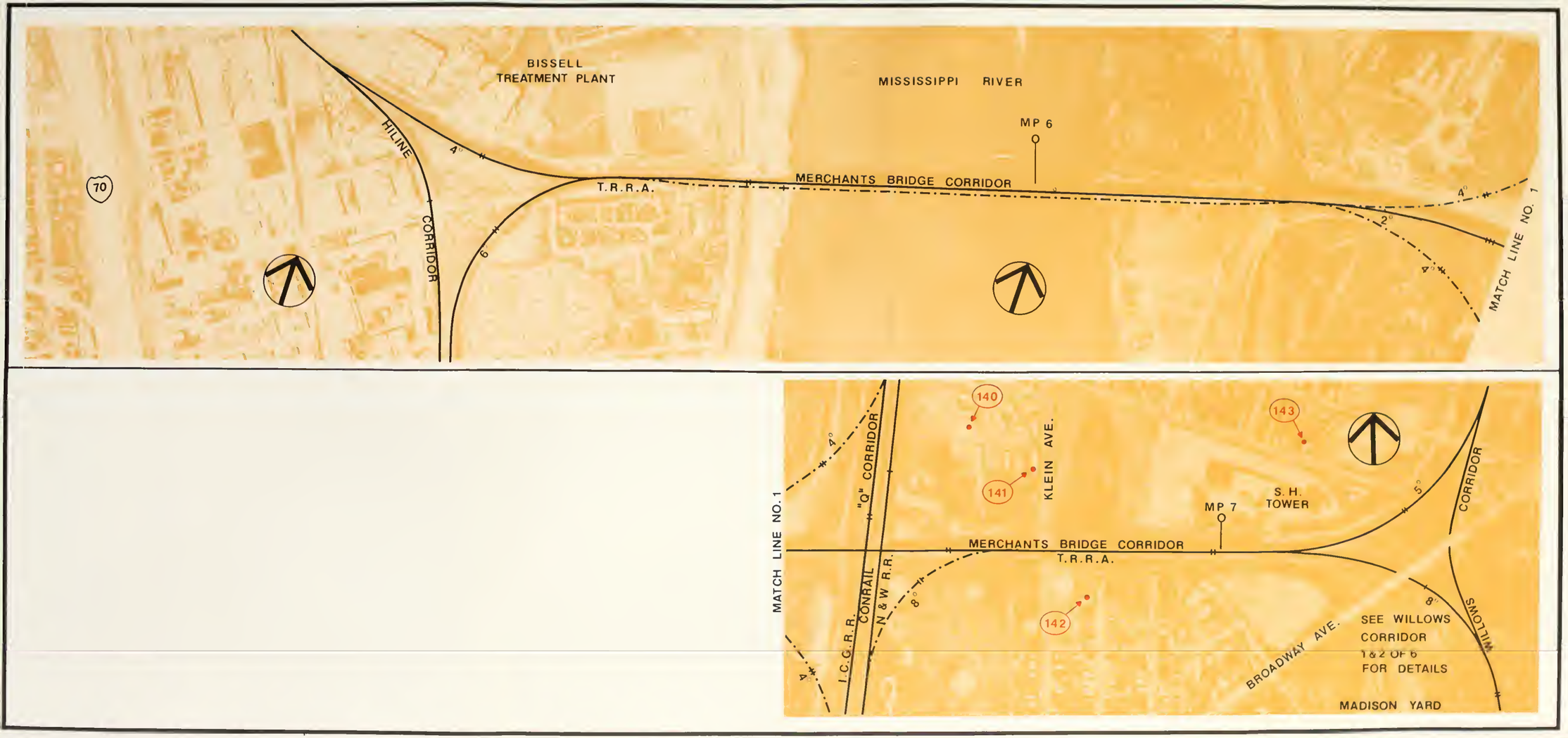
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 1 OF 1

MERCHANTS BRIDGE CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- NOISE RECEPTOR

400 200 0 400

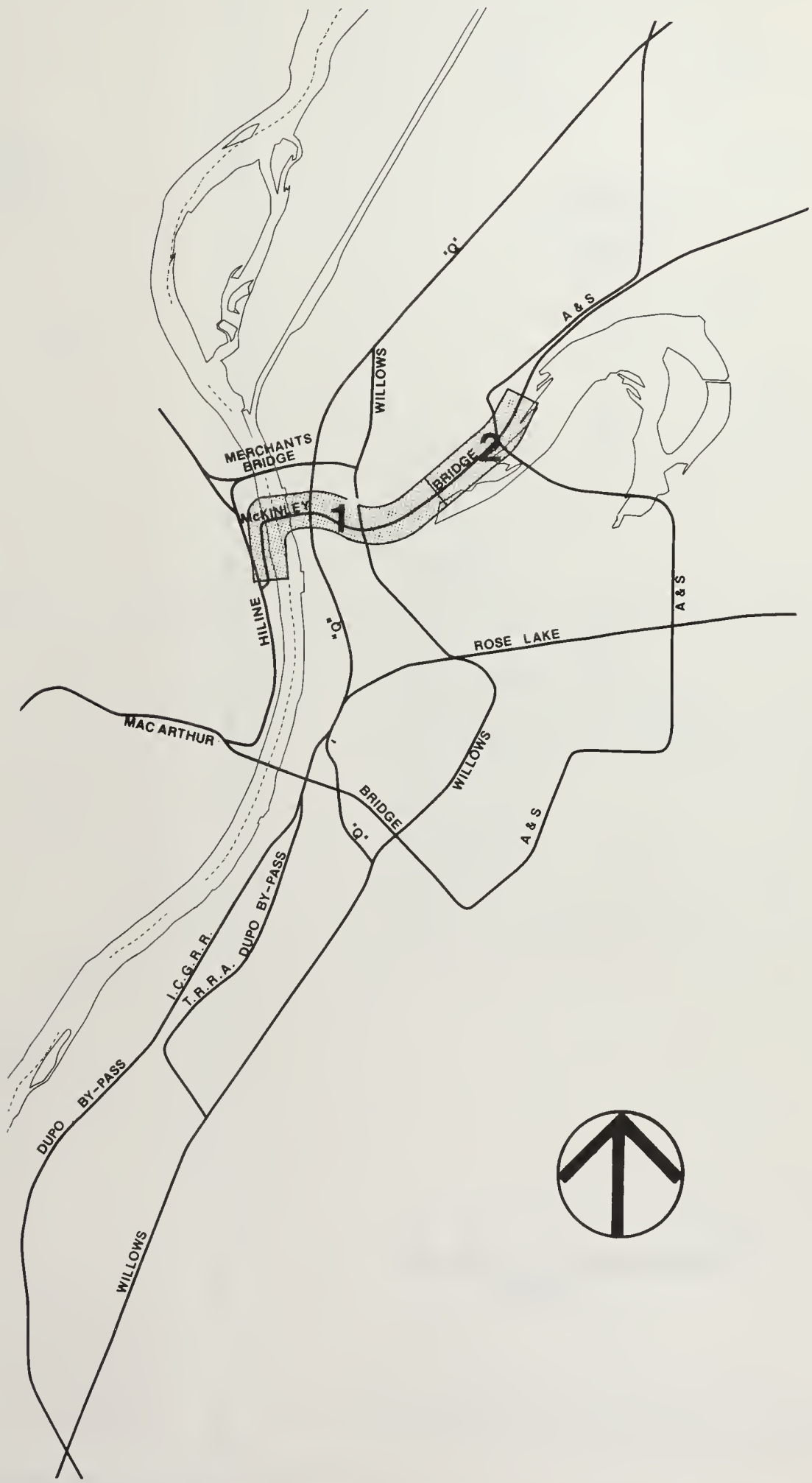
SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGH

Section XI

MC KINLEY BRIDGE CORRIDOR

KEY MAP



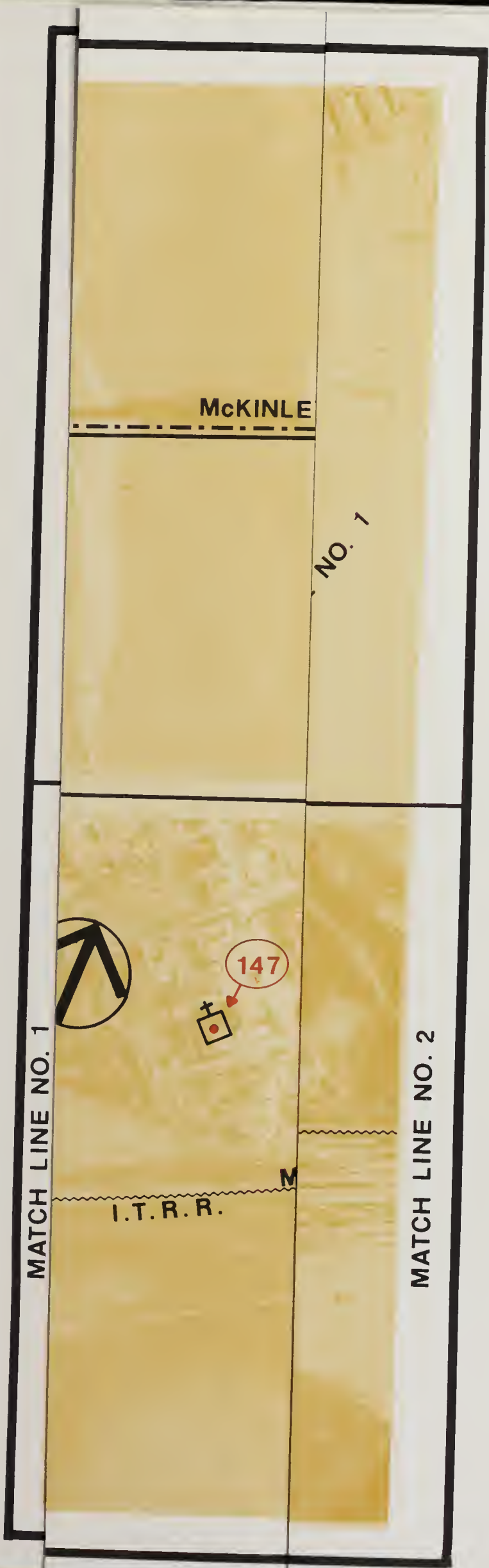
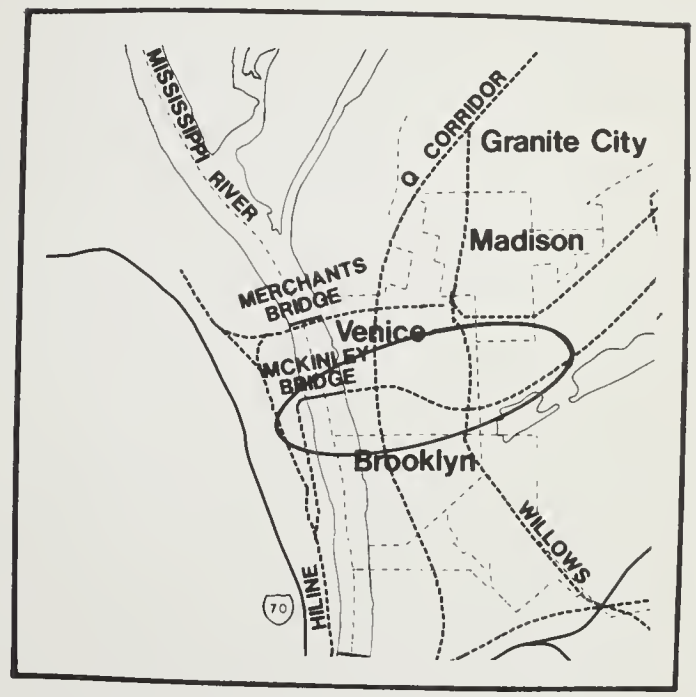


FIGURE 1 OF 2

MC KINLEY BRIDGE CORRIDOR



VICINITY MAP

LEGEND

EXISTING RAIL
PROPOSED RAIL
NUMBER OF TRACKS
(Designated by Vertical Lines)
MILEPOST
SCHOOL
CHURCH
RAIL TO BE RETIRED
NOISE RECEPTOR

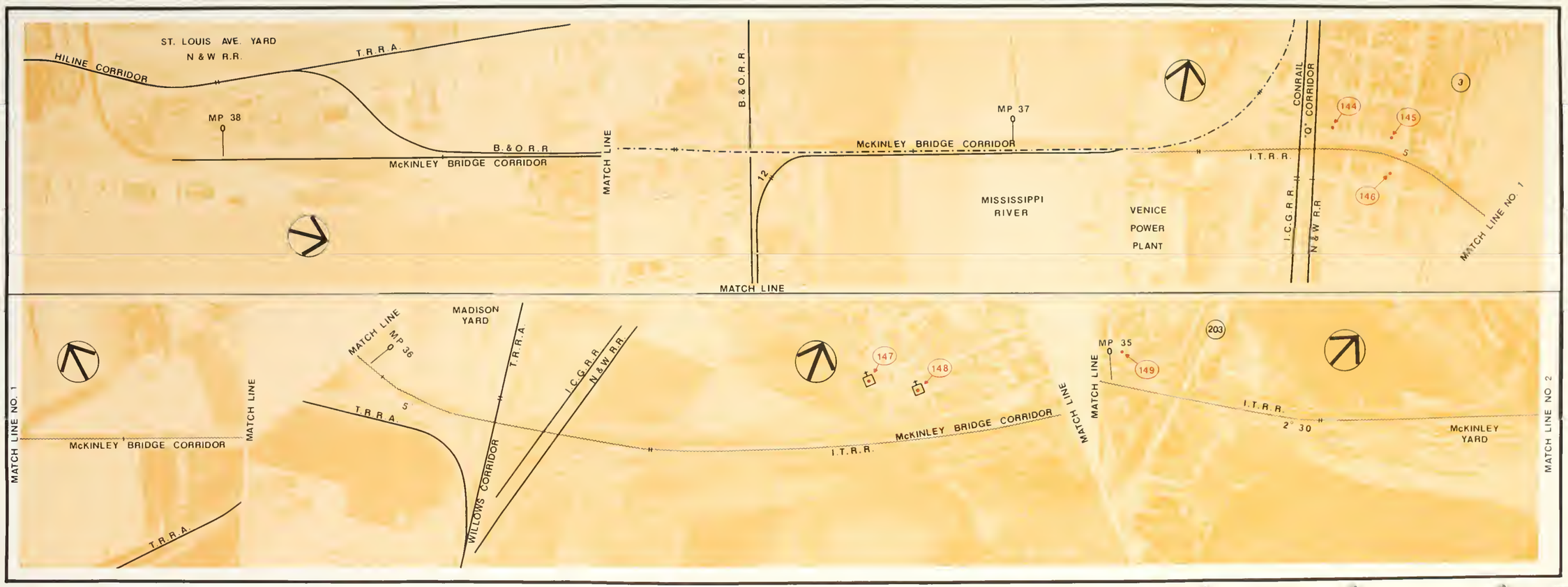
400 200 0 400

SCALE IN FEET

ST. LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

FIGURE 1 OF 2

MC KINLEY BRIDGE CORRIDOR



VICINITY MAP

LEGEND

- EXISTING RAIL
- PROPOSED RAIL
- NUMBER OF TRACKS (Designated by Vertical Lines)
- MILEPOST
- SCHOOL
- CHURCH
- RAIL TO BE RETIRED
- NOISE RECEPTOR

400 200 0 400

SCALE IN FEET

ST LOUIS MARGE PROJECT
SVERDRUP/ENVIRODYNE/KNIGHT

UNIVERSITY OF ILLINOIS-URBANA
3 0112 121950254